LEARNING and HUMAN ABILITIES:

Educational Psychology

by Herbert J. Klausmeier

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Herbert J. Klausmeier

UNIVERSITY OF WISCONSIN

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Preface

Those who teach must know how to influence learning processes of others. They must also be concerned with the abilities that human beings can demonstrate with good instruction, whatever their present innate and acquired characteristics. Understanding and nurturing the range and variety of emergent abilities of children and youth—nursery through graduate school—is a dramatic challenge facing us today. Increasingly, it is recognized that the greatest opportunity for stimulating learning under desirable conditions is in school settings, mainly classrooms.

My purpose in this book is to set forth a theory of classroom learning and to bring together research findings that deal with efficiency of learning. Recognizing that the effects of maturation and learning and of biological and cultural factors are closely related in achieving learning outcomes efficiently, I have tried to bridge the gap between growth and learning as separate entities through use of the concept of human abilities.

Chapter 1 serves as the introduction in which the nature of human abilities and of teaching-learning processes is treated. Specific attention is given in Chapters 2–5 to describing the main components in an educational setting and their relationship to efficiency of learning. The objectives sought, the types and range in abilities and other characteristics of the students, the types and range of abilities and other characteristics of the teacher, and the interactions among the teacher and students are discussed. The treatment of each of these within a chapter is necessarily concise. The References and Suggestions for Further Readings at the end of these and all other chapters are intended to help the instructor and student locate more information readily. Heavy use was made of six books of readings in the Suggestions for Further Readings; these books are more readily available in libraries than are bound periodicals containing reports of original research.

In Chapters 6–10, outcomes of learning are organized and discussed under three headings: Cognitive, Psychomotor, and Affective. In each chapter the nature of the outcomes and underlying processes are treated first; then the developmental trends in acquiring the outcomes are given; and finally the principles for improving efficiency of learning are identified and explained. The principles in these and other chapters are stated as instructional principles, beginning with a verb form; the teacher or other person who guides the learners in informal or more formal settings is the assumed subject.

Many years of teaching educational psychology led to this form for stating the principles. Students have difficulty in inferring what explanatory principles or laws as stated by Hull, Tolman, Skinner, and other theorists mean for directing their own learning activities or the activities of those they may teach.

Efficiency of achieving the learning outcomes discussed in Chapters 6–10 is in part a function of motivation, type of material, method of learning, and provisions for individual differences. These matters are dealt with in Chapters 11–13. As attempts are being made to utilize technological inventions and other arrangements in teaching–learning processes, psychologists and educators must be concerned with TV instruction, teaching machines, electronic laboratories, instructional teams, and the like. Chapter 14 deals with new settings and contexts for learning.

In Chapter 15 the main purposes and features of evaluation and measurement are first presented and then a number of the notable published tests are described. Tests which have wide applicability in the schools, Grades 1–12, are given major attention; however, several instruments used in research on teacher effectiveness are also discussed. In Chapter 16, informal procedures of evaluation, including teacher-made tests, are considered. Chapter 17 is devoted to the statistical and research terminology frequently encountered in research reports such as those listed in the References at the end of each chapter. Since reference to tests and statistical terminology is made early in Part I, the student will profit from using Chapters 15-17 to familiarize himself with any new material which he encounters.

I have indicated frequently in the book that knowledge about many phenomena connected with learning and human abilities is incomplete. This may be disconcerting for students who want solutions that can be applied immediately to their problems. But the inquiring student will find substantial information about these areas of incomplete knowledge as well as guides to chart his subsequent efforts. I assume that some of the present generation of college students and teachers eventually will contribute new methods and knowledge in this exciting field at a more rapid rate than has the previous generation.

HERBERT J. KLAUSMEIER

November, 1960

Learning and Human Abilities: Educational Psychology

Part I Essential Components of Teaching–Learning Situations

What are your present abilities? What are the abilities of human beings at various age levels? Does man today possess more and higher-level abilities than he did 1000 years ago? 5000 years ago? Do children and youth in the United States learn more now than did the children and youth of 200 years ago? Should or must the next generation learn more than the present one? What do we know about teaching–learning processes in school or other educational settings that might enable us to raise the level of human abilities generally, to add to mankind's accumulating knowledge and skills, to enable mankind to understand himself and others better and behave accordingly? Questions such as these cannot be answered finally, but they must be raised and given serious attention.

In Chapter 1 an overview of the nature of human abilities and of teaching–learning processes is given. There are several main components in any educational setting which affect what is learned and the efficiency with which it is learned. These components, discussed in Part I, are the goals sought (Chapter 2), the types and range of abilities of learners (Chapter 3), the types and range of abilities and other characteristics of teachers (Chapter 4), and the interactions among the teacher and pupils within the educational setting (Chapter 5). Any theory of learning which intends to serve as a tool for improving human abilities and for facilitating human learning must take into account these four and other less important components of educational settings.

Chapter 1 Human Abilities and Teaching-Learning Processes

The greatest problems facing mankind are raising the level of human abilities and improving interpersonal relationships. More people must learn to understand and control the physical world and manage themselves in it in such fashion that each achieves a reasonable degree of self-realization. In this respect the challenges to psychology and education are far more complex now than they were fifty or even twenty years ago. Man's knowledge of himself, of others, and of the physical world is increasing at a very rapid rate. Man's skill in controlling the physical environment through a variety of inventions and discoveries is also increasing rapidly. Somehow children must more efficiently acquire more of this knowledge and the related skills and attitudes, or with each consecutive generation each individual will be less aware of what is known to mankind. We have the biological characteristics necessary for learning; what we eventually make of these characteristics depends upon the efficiency with which we learn.

The school is the institution in our society organized and supported to promote efficient learning—to assist learners in acquiring and improving the many cognitive and psychomotor abilities which previous generations required thousands of years to generate. How long did it take mankind to develop the alphabet which children now learn to use in the first grade? the number system which many children in the third grade understand and use quite well in solving many immediate problems? printing, combustible engines, atomic power, satellites, vaccines, and antibiotics? Unknown to mankind only a short time ago in his long history, these concepts are now appropriately studied in the elementary grades.

The scope of this introductory chapter is very broad, as is the nature of human abilities and of learning. The intent is to provide a focus for the entire book through a discussion of (1) the nature of human abilities; (2) the processes of learning; (3) maturation and learning; (4) factors affecting efficiency of teaching-learning processes.

THE NATURE OF HUMAN ABILITIES

What is an ability? An ability is the "actual power to perform an act, physical or mental, whether or not [the power is] attained by training and education. . . . Ability implies that the task can be performed *now*, if the necessary external circumstances are present; no further training is needed." Accepting this definition of ability from *A Comprehensive Dictionary of Psychological and Psychoanalytical Terms*,[1] we properly infer that human abilities change with age—the ten-year-old has many abilities which the infant does not. Similarly, a highly intelligent and physically strong ten-year-old demonstrates more or higher-level abilities than does a ten-year-old of low intelligence and low coordination. We also infer that the main task of education is to assist learners to acquire new or higher-level abilities as they progress through school.

What is the relationship between capacity and ability? Tests are designed to measure abilities—what the testee actually performs. On the basis of certain measured abilities, we can infer capacity or what the individual might be able to do some time hence with further maturation and education. In this sense, the items in an IQ test sample present abilities from which future performances or abilities are inferred. To clarify the relationship between capacity and ability, imagine two quart milk bottles side by side. We see that each has the capacity for holding a quart of milk. One bottle is half full, the other entirely. The present ability of the two bottles to provide milk is unequal, although both have the same capacity. This analogy to the capacity and ability of the milk bottles may serve to clarify the terms. But there it stops, for our means of measuring present abilities by which to infer accurately future abilities are much less adequate in the field of human learning than in the physical world of liquid, linear, and other measures.

What is the relationship between abilities and learning? Again accepting one set of descriptions of learning from English and English: "A highly general term for the relatively enduring change, in response to a task-demand, that is induced directly by experience; or the process or processes whereby such change is brought about. Not included under learning are changes due to bodily injury or surgery, disease, fatigue, sensory adaptation. . . . Learning is manifested by performance, and all performance is dependent in part on learning, but the two are not identical."

By definition, all human abilities are learned. Beyond this, the learning of certain abilities makes possible the learning of other abilities. For example, speaking words normally precedes reading words, and reading normally precedes spelling the words. Further, as pointed out in the introductory paragraphs, many mature individuals demonstrate abilities which mature individuals of a century ago did not.

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[1] By Horace B. English and Ava Champney English, Longmans, Green and Co., 1958. The author has referred to this volume throughout the writing of this book. He hopes, with English and English and their consulting editors, that, increasingly, psychological terms will convey the same meanings to readers of the many books and other writings of psychologists.

Let us now get the three key terms—ability, capacity, and learning—in proper relationship with an example. When a healthy infant is born, we properly infer that he has the capacity to learn all the abilities characteristic of the human species which have been transmitted to him through heredity. For example, when sufficiently mature, the infant will smile, crawl, walk upright, run, hop, skip, talk, sing, and so on. Some of these abilities will be acquired with little if any instruction and with relatively little learning. With instruction at home or in school he will acquire other abilities that people without instruction do not—the ability to read, spell, write, count, swim, play a musical instrument, drive an automobile, and many others.

At present, we have identified and classified a number of human abilities, ranging from general to highly specific. A general mental ability, as measured by certain IQ tests, correlates positively and high but far from perfectly with achievements in subject fields such as English, mathematics, science, and social studies. A more specific ability, such as numerical reasoning, correlates much higher with achievements in mathematics than in English. The more we know about the type and level of human abilities, the greater the possibility for teachers and other school personnel to assist students in learning efficiently. We are yet in the early stages of systematically identifying and categorizing abilities in human beings, from infancy to adulthood, but have made more progress in this direction since 1900 than during the previous recorded history of mankind.

Table 1.1 is a schematic arrangement of many possible human abilities and related outcomes of learning under three main headings: cognitive, psychomotor, and affective. The existence of affective abilities is questioned because neither the processes nor the contents are well understood. However, the emotional state and other affective characteristics of the learner vitally affect the efficiency with which the outcomes in the cognitive and psychomotor areas are acquired; and the affective outcomes of learning, e.g., feelings and attitudes toward self and others, are highly significant not only in school settings but in society generally.

Two examples will clarify the relationship between cognitive and psychomotor abilities as applied to areas of school learning. In a child's acquiring facility in reading, the main learnings involve the cognitive processes of perception, discrimination, abstraction, generalization, and remembering; and, at a high level of reading, imagining and creating. However, some of the psychomotor abilities are involved in the child's learning to handle the book properly, to sit properly, and to focus his vision on the printed page in a right-to-left and a top-to-bottom sequence. In learning

TABLE 1.1. Schematic Arrangement of Human Abilities and Related Outcomes of Learning

COGNITIVE DOMAIN

Abilities—Processes Combined with Contents

Processes	*Contents*[a]	*Outcomes*
Perceiving Remembering Discriminating Integrating Abstracting Generalizing Evaluating Imagining Thinking Problem-solving Inventing Creating	Figural—concrete material perceived through senses; actual things that are seen, heard, felt, etc. Symbolic—letters, digits, and other signs, usually organized in general systems such as the alphabet. Semantic—verbal meanings or ideas. Behavioral—?	Facts, concepts, skills, and performances connected with such curriculum areas as language arts, social studies, science, mathematics, foreign language, and others. The same outcomes are closely related to some psychomotor performances.

PSYCHOMOTOR DOMAIN

Abilities

Factors or Processes[b]	*Contents*	*Outcomes*
Strength Speed Impulsion Precision Coordination Flexibility	Bodily manipulation in such activities as walking, running, dancing, etc. Object manipulation—tools, pencils, typewriter keys, musical instruments, etc.	Motor sets and skills connected with such curriculum areas as physical education, handwriting, typing, instrumental music, home economics, agriculture, industrial arts, vocal music, dramatics, speech, etc. Psychomotor outcomes are closely related to some cognitive outcomes.
Vocal—circulatory-respiratory endurance, muscular endurance.	Vocal movements connected with voice productions of all types.	

AFFECTIVE DOMAIN

Abilities (?)

Processes—?	*Contents—?*	*Outcomes*
		Feelings, attitudes, and values toward self, others, and things; interests and motives; personality integration and character.

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[a] Based on Guilford, 1959.

[b] Based on Guilford, 1958, p. 165.

to play a musical instrument efficiently, strength, speed, impulsion, flexibility, precision, and coordination are involved in perfection of the physical movements. The reading of notes to guide the movements involves the development or use of some of the cognitive abilities as outlined above. Note, however, that once the motor aspects of reading a printed page are habitual, and this comes at an early point in reading, developing higher abilities in reading is primarily cognitive. Once note reading is fairly well mastered, acquiring high efficiency in playing the instrument is largely the result of improvement of psychomotor abilities. Affective characteristics of the individual are associated with learning to read and to play a musical instrument throughout the sequence in learning. We turn now to a further discussion of human abilities as outlined in Table 1.1. Since the reader already possesses many of the abilities, it would be well to test out anything not understood by evaluating it against one's own experiences.

Cognitive Abilities

Cognition refers to the processes whereby an individual obtains knowledge about anything—perceiving, remembering, discriminating, integrating, abstracting, generalizing, evaluating, imagining, thinking, problem-solving, and creating. Remembering is included, for if what is acquired is not remembered, it cannot be ascertained that cognition has occurred.

Cognitive abilities include the content of what is acquired as well as the process. Perceiving, discriminating, and integrating, for example, do not occur in a vacuum; always there is perception of something; discrimination of at least two somethings; and integration of several somethings. Thinking and problem-solving also always occur in some context, and the contents of thinking or problem-solving usually, if not always, involve the use of symbols—words and other signs. Since the terms used to describe the processes may convey a variety of meanings, those uses of the terms which fit the author's intent are now given from English and English. The entry word to which the reader should go to find further information in *A Comprehensive Dictionary of Psychological and Psychoanalytical Terms* is given:

perception: 4. a *sensation,* together with a context of other experiences that give it meaning.

remember: to reinstate some part, or all, of a previous experience so that it may function in present behavior. . . .

discrimination: 1. the process of detecting differences in objects.

integration: the process . . . of bringing together and unifying parts in a whole. . . . It is a stronger term than association, coordination, or organization.

abstract: 1. to consider a quality apart from the object, or apart from other qualities with which it is actually found; to separate, mentally or in words, a quality or aspect of a thing from its concomitants.

generalization: The process whereby one reaches a judgment applicable to a whole class, often on the basis of experience with a limited number of the class. . . . The process is not necessarily a jump to a final conclusion: there is often a sort of preliminary generalization which is extended (or restricted) as further facts are perceived. . . .

evaluation: [the process of] determining the relative importance of something in terms of a standard.

imagine: to respond to the properties of an object or event not present to the senses. . . .

thinking: 3. meditating or reflecting upon a problem in order to understand the relationships involved.

problem-solving: the process of selecting from a number of alternatives those that lead to a desired goal. [Most of the previously mentioned processes are involved in knowing what the alternatives are.]

creativeness: ability to find new solutions to a problem or new modes of artistic expression; bringing into existence a product new to the individual (not necessarily new to others).

Guilford (1959) described five intellectual operations or processes—cognition, memory, divergent thinking, convergent thinking, and evaluation. Guilford did not classify memory, thinking, and evaluation as cognitive processes but as intellectual processes. He did not include perception; however, he defined cognition as meaning "discovery or rediscovery or recognition." Other psychologists believe that perception is essential to cognition, as proposed in the definition by Guilford; and in learning to read well, for example, there must also be discrimination, abstraction, integration, and generalization. Further, memory, thinking, and evaluation can also be classed as cognitive processes inasmuch as they cannot occur without previous perceptions or cognitions.

The contents which combine with these processes are figural, symbolic, semantic, and behavioral:

> Figural content is concrete material such as is perceived through the senses. It does not represent anything except itself. Visual material has properties such as of size, form, location, or texture. Things we hear or feel provide other examples of figural material. Symbolic content is composed of letters, digits, and other conventional signs usually organized in general systems, such as the alphabet or the number system. Semantic content is in the form of verbal meanings or ideas, for which no examples are necessary. . . . [The behavioral content] has been added on a purely theoretical basis to represent the general area sometimes called "social intelligence" [Guilford, 1959, pp. 470, 471].

Returning again to Table 1.1, we see that the processes, combined with contents, are the abilities and that there may be many such abilities. It should be noted in connection with the schema proposed in Table 1.1 that thinking cannot occur in the absence of the processes preceding it, nor can problem-solving be accomplished without thinking. Creating always involves problem-solving and thinking, but the focus here is on the production of new problems or new means of expression. In this way thinking, problem-solving, and creating are more complex processes of higher order than those listed above them.

The outcomes of learning from the application of these abilities are facts, concepts, and related skills, which are required in learning to read, spell, use language correctly, solve mathematical problems, understand and control various elements of the physical environment, and the like. In turn, as the individual engages in such learning activities, the cognitive abilities are nurtured and improved.

Psychomotor Abilities

Guilford (1958) made a systematic and comprehensive survey of research completed in the field of psychomotor abilities and subsequently identified six psychomotor factors which he believed to be involved in many kinds of motor performances. The present writer proposed the three types of contents—bodily manipulation, object manipulation, and vocal movements. The factors shown in Table 1.1 are strength, speed, impulsion, precision or accuracy, coordination, flexibility, and other possible abilities in the vocal area such as muscular endurance and circulatory-respiratory endurance. Strength, speed, coordination, precision, and flexibility are quite familiar terms. Impulsion pertains to the rate at which movements are initiated from stationary positions, thus distinguishing it from speed, which pertains to the rate of movements after they have started. Guilford suggests further that precision has to do with the accuracy with which bodily positions can be held and also with precision of directed movements once started. Flexibility is suggested as pertaining to the extent to which a part of the body is free to bend or to the scope of movement pertaining to a particular joint. In addition to these six major factors, muscular endurance, circulatory-respiratory endurance, and perhaps other psychomotor factors are thought to be basic to vocal activities such as singing and speaking.

In the many perceptual motor skills taught in the schools—drawing, handwriting, typewriting, shorthand, the making of maps in social studies, the making of objects in home economics, agriculture, industrial arts, and other classes—a combination of several of the psychomotor abilities is used. The same is true in a variety of purely physical performances without the use of objects in physical education classes and in dramatics and speech classes. Further, in a perceptual motor task such as shorthand or playing a musical instrument which requires not only the physical movements but also perceiving the words or the musical notes that are to direct the physical movements, a combination of cognitive abilities is also involved.

Besides skills as outcomes of learning in the psychomotor domain, there are also motor sets. Thus when an individual gets ready to hit a golf ball, or to bat, or to type, or to start playing a musical instrument, he has a feeling within himself about the proper stance and proper body attitude with which to address himself to the task. From observation of an individual's performances and from the individual's own verbalization of how he thinks as he prepares to do something, we have some knowledge of motor set; but it is relatively difficult, if not impossible, for an individual to accurately verbalize the motor set. The many neural connections from the brain to the muscles and joints, although felt, cannot be accurately described. Somewhat as cognitive abilities are improved through engaging in purposeful learning of reading, solving problems, and the like, so the psychomotor abilities are also brought to higher levels through engaging in a variety of physical activities.

It is easy to underestimate the importance of psychomotor abilities in the over-all development of mankind. There is a tendency to think of the great literature, the great advances in architecture, medicine, and the like, almost exclusively in terms of cognitive abilities. Nevertheless, the musical composer, the painter, the author use many psychomotor abilities in developing their products. The great advances recently made in surgery of the brain and heart also require the highest level of psychomotor abilities—manipulation of instruments with speed, precision, coordination, and flexibility.

Affective Characteristics

Affect refers to the feeling aspect of human behavior. Unfortunately, this area of human behavior has only recently been subjected to scientific investigation. Many schemes have been proposed for categorizing the emotions of man—his temperament, his emotional needs, his social needs, and the like. Rather than attempting to list or describe the many arrangements or to hypothesize possible affective abilities, affective characteristics will be discussed in this text only in connection with outcomes of learning in the affective domain.

Feelings toward self and others, attitudes and values toward self and others, emotional expressions and adjustments, are all heavily loaded with hedonistic terms: like–dislike, pleasure–displeasure, pain–pleasure. Thus, though each outcome in the affective area shown in Table 1.1 has a cognitive and sometimes a psychomotor aspect, our feelings, attitudes, interests, and motives are usually flavored with the feeling component. In addition, a learner can acquire unfavorable feelings or attitudes toward the learning of any cognitive or psychomotor skill to the point that he will not acquire it efficiently.

THE PROCESSES OF LEARNING

Learning is a process whereby a change in behavior results from some form of experience—activity, training, observation, and the like. Change in behavior which results from such forces as bodily injury, disease, fatigue, or use of drugs is not considered learning. As will be pointed to in a subsequent section, some behavior changes result primarily from maturation.

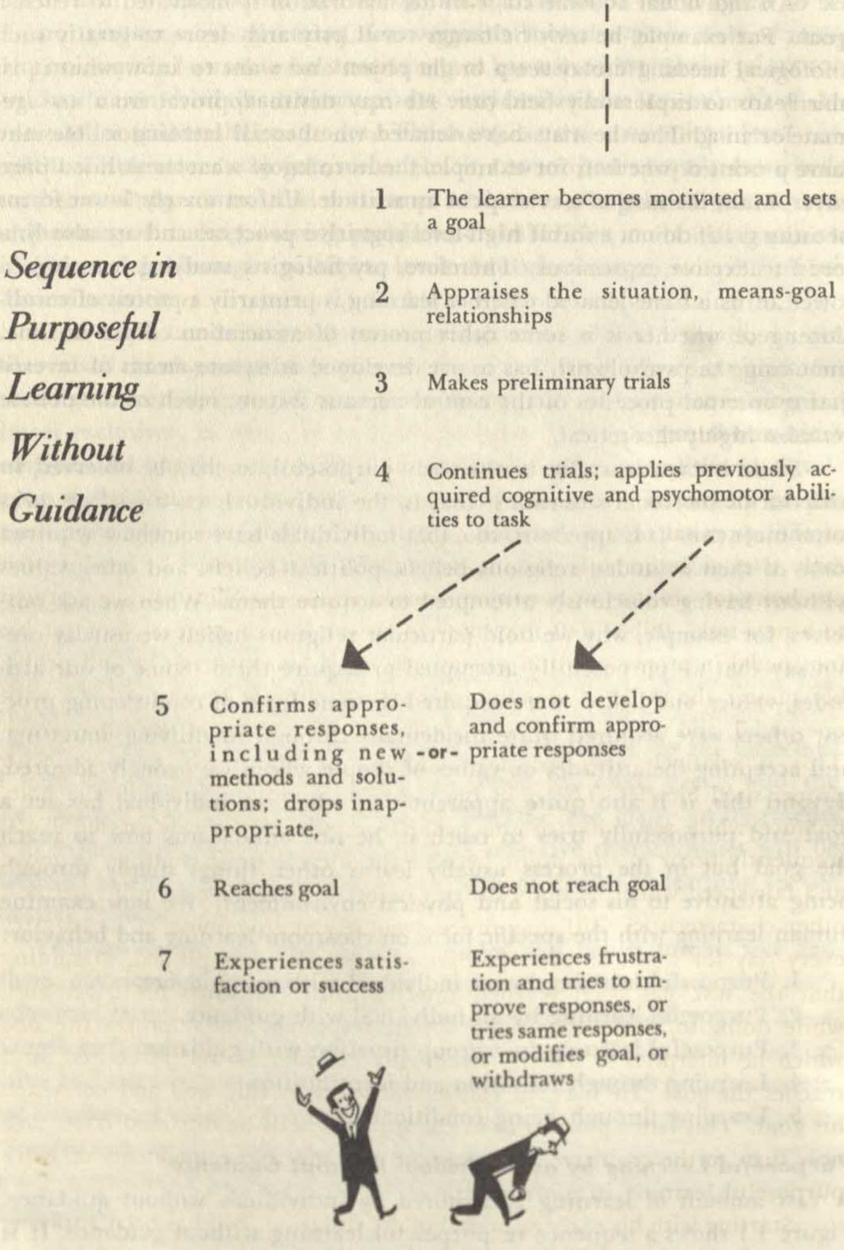
Many learning theorists up to the present have drawn information primarily from animal studies and have subsequently made inferences about human learning. The theorists have debated whether all learning follows the same process or whether, for example, the learning of a motor skill is different from the learning of a concept or an attitude. Unfortunately, lower forms of animal life do not exhibit high-level cognitive processes and are also limited in affective expressions. Therefore, psychologists studying learning in lower animals have debated whether learning is primarily a process of conditioning or whether it is some other process of association. Since no one, including the psychologist, has as yet developed adequate means of investigating internal processes of the central nervous system, much of the debate remains highly theoretical.

Some human learning is obviously purposeful, as may be observed in and out of classroom situations; that is, the individual sets a goal or seeks some incentive. It is apparent, too, that individuals have somehow acquired some of their attitudes, religious beliefs, political beliefs, and other values without having consciously attempted to acquire them. When we ask ourselves, for example, why we hold particular religious beliefs we usually cannot say that we purposefully attempted to acquire them. Some of our attitudes, values, and beliefs were acquired by some form of conditioning process; others were acquired quite incidentally through identifying, imitating, and accepting the attitudes or values of people whom we strongly admired. Beyond this, it is also quite apparent that when an individual has set a goal and purposefully tries to reach it, he not only learns how to reach the goal but in the process usually learns other things simply through being attentive to his social and physical environment. We now examine human learning with the specific focus on classroom learning and behavior:

1. Purposeful learning by an individual without guidance.
2. Purposeful learning by an individual with guidance.
3. Purposeful learning in a group situation with guidance.
4. Learning through imitation and identification.
5. Learning through being conditioned.

Purposeful Learning by an Individual Without Guidance

A vast amount of learning is acquired by individuals without guidance. Figure 1.1 shows a sequence in purposeful learning without guidance. It is this sequence which the author feels best describes how individuals acquire most of their intellectual and psychomotor abilities and some of their affective characteristics. To clarify the sequence, observation of young children learning to ride a bicycle, to skate, or to write without assistance can be made. Also,



Sequence in Purposeful Learning Without Guidance

1 The learner becomes motivated and sets a goal

2 Appraises the situation, means-goal relationships

3 Makes preliminary trials

4 Continues trials; applies previously acquired cognitive and psychomotor abilities to task

5	Confirms appropriate responses, including new methods and solutions; drops inappropriate,	-or-	Does not develop and confirm appropriate responses
6	Reaches goal		Does not reach goal
7	Experiences satisfaction or success		Experiences frustration and tries to improve responses, or tries same responses, or modifies goal, or withdraws

FIGURE 1.1.

in analyzing the examples which follow, the reader might profitably think about his present repertoire of learned behaviors and attempt to decide the extent to which the sequence in Figure 1.1 applies.

An individual at some stage in his maturation is motivated to reach a goal. For example, he may be hungry or thirsty and desire to gratify such biological needs. He may see a bright object and want to know what it is; this leads to exploratory behavior. He may desire approval from an age-mate or an adult, or he may seek another form of social satisfaction. He may have a printed page in front of him and want to know what the printed page says. Thus, the motive may arise in connection with an unsatisfied need for sensory gratification, a social need for approval, a need to achieve mastery, a need to explore, or various combinations of these.

Let us assume that a young child, Bill, already rides a tricycle well. After receiving a bicycle, he is highly motivated to ride it and sets as his goal (not using the word "goal," of course) to ride it as well as an age-mate. He has now experienced the first phase outlined in Figure 1.1—becoming motivated and setting a goal.

Bill now appraises the situation—the bicycle, himself, and his relationship to the bicycle. He makes preliminary trials almost immediately as part of the appraisal of the situation. These early trials, much like a person's early tries at automobile driving, are usually characterized by lack of such psychomotor abilities as precision, coordination, and flexibility as applied to a new task. Bill at first may not mount the bicycle properly nor get his foot pedal in proper position to start off. After several trials he will probably master the skills of starting, making a complete revolution first with one pedal, and then keep going to make the revolution of the other pedal. This is relatively easy for most children at about five to seven with proper-sized bicycles. The next big task is to maintain and shift the body balance while returning to the pedal from which the ride started. Falls frequently occur at this point because the bicycle must continue to move at a fair speed while the body shifting occurs. Depending upon his size and other characteristics, Bill may proceed quickly at this point, or he may try every day for weeks to get this part of the task accomplished. Assuming that the task has been learned thus far, Bill continues his trials and, while doing so, drops the inappropriate responses and improves the one which he interprets as useful. Eventually he rides as well as desired, and reaches the goal. He may, of course, not learn to ride well and not reach his goal. This latter possibility in the sequence will be discussed later. We now turn to the cognitive processes and the affective components of Bill's purposeful learning in more detail.

Starting with his early appraisal of the situation, Bill has been applying previously acquired abilities to the task; to do this, *perceiving* and *remembering* are essential. Whatever he has already learned and can reinstate in present behavior about guiding and pedaling a tricycle, he applies as best he can to the bicycle. Before there can be much application, Bill must *discriminate* sufficiently well to recognize some elements of bicycle riding as different from tricycle riding. This discrimination is partly visual and partly kinesthetic and includes the different feeling on the bicycle. Thus, though not able to verbalize it, Bill is visually discriminating and also discriminating kinesthetic feelings. Once Bill has developed some feel for the handle bars, foot pedals, the balance, and the movements, he *integrates* these into better coordinated and more efficient actions generally. Toward the end of each trial Bill must also be able to *generalize* his visual and kinesthetic learnings to subsequent trials. Again this generalizing is often not accompanied by verbalization; Bill may see and feel what he is doing without being able to describe in words precisely what he has learned or what he is going to apply in his next trial on the bicycle. Thus little or no *abstracting* may take place throughout the sequence.

On his own, without guidance, Bill has been confirming appropriate responses and dropping the inappropriate through the process of *evaluation;* that is, he himself has decided what actions and movements lead toward riding the bicycle, and these have been incorporated into his new response system. Similarly, actions and movements which do not work are dropped. The unguided learner must make these decisions himself. They are not difficult to make in a task such as bicycle riding because one can directly experience whether or not he is making progress.

As soon as Bill feels that he is making progress or actually rides the bicycle as well as he had originally set out to do, he experiences satisfaction—the affective component in the learning sequence. The affective component first entered when he wanted to learn originally, and throughout the entire learning sequence the affective component is present. Bill is learning likes and dislikes and experiencing feelings of satisfaction and dissatisfaction in all his trying.

Suppose that with best and continued efforts, Bill is not able to ride the bicycle as well as he would like or not at all. After trials accompanied by feelings of failure, he may engage in a variety of behaviors. The behavior which might be most appropriate and lead to future success would be to try to improve his responses with further effort. If he has no basis for making improvements, he may simply continue to try as he has in the past with the possibility that such trying will lead to success. Bill may, however, quit. It is not uncommon for individuals to quit after experiencing repeated failure with best efforts. In the case of riding a bicycle most children do not quit; they continue trying. Rather than quitting, trying the same responses as previously or trying new responses, an individual without guidance may substitute a different goal if convinced that the present goal is unattainable. Bill, if unable to learn to ride the bicycle, may continue on his tricycle and attempt to perfect skills in riding it.

Learning to ride a bicycle takes many tries. Consider an example of verbal learning which is purposeful, without guidance, and which may be accomplished in few trials and in a short time. Suppose that Mary, a fifth grader, is reading about a basketball game in her school. She wants to understand the account fully; she is motivated. Suppose that Mary encounters the following sentence with the italicized word being one that she presently cannot read:

John scored his lone point at a *crucial* moment.

Referring again to the sequence in purposeful learning in Figure 1.1, examine how the sequence applies. Mary directs her attention toward the unknown word and looks at this word in relation to the other words in the sentence. She also looks at the whole sentence in relation to the entire story. Her preliminary trials to pronounce the word may come after she has tried to get its meaning from the context of the sentence or paragraph. If this does not work, Mary may look at the various letters in the word and try to pronounce them. Or, she may try to divide the word into syllables. If Mary has had good previous instruction in reading she will probably attempt all three. Eventually she will come forth with some pronunciation of the word, correct or incorrect, or may simply give up.

Perceiving, of course, was involved from the start in assessing the situation. Mary's knowledge of the alphabet and the sounds, her ability to divide a word into syllables, and her ability to try to get the pronunciation of the word from the context in which it appeared were available in the present situation to the extent that she could remember and apply them. To get the correct pronunciation, Mary must be able to discriminate the letters and syllables. Once she divides the word into parts and attempts to pronounce each of the syllables, she must be able to integrate these separate part sounds into the whole to get the correct pronunciation. Mary may or may not be able to generalize from this learning experience to other experiences. The key letters are "ci" with the "sh" sound. If Mary reads words such as racial or facial, she can generalize from the previous to the present situation. If Mary does pronounce the word correctly and understands its meaning, then some degree of abstraction is necessary—Mary must recognize that the word stands for a reality.

Unguided, Mary accepts the pronunciation that makes most sense to her, the one that best completes the meaning and her appraisal of its pronunciation. It is possible that from the context the word might be "critical" rather than "crucial." Regardless of whether Mary pronounces the word as *critical* or *crucial,* she has reached her goal and experiences satisfaction. This is a difficult word, however, for fifth graders. It is possible that Mary may realize that she cannot read it. In this case, she does not reach the goal of getting full meaning but she may have sufficient meaning that she quits

Role of Teacher in Purposeful Learning

The Learner

The learner becomes motivated and sets a goal

Appraises the situation, means-goal relationships

Makes preliminary trials

Continues tries; applies previously acquired cognitive and psychomotor abilities to the task

Confirms appropriate responses, including new methods and solutions; drops inappropriate

Reaches goal	**Does not reach goal**
Experiences satisfaction or success	Experiences frustration and tries to improve responses, or tries same responses, or modifies goal, or withdraws

The Teacher

Gets learner to want to learn; helps learner set realistic goal

Arranges situation so learner has maximum opportunity to appraise crucial elements of situation

Assists learner in deciding first tries or methods of attack, or actually helps learner with early trials, thus eliminating some incorrect tries

Helps learner to improve, to identify and apply previous learnings

Reinforces learner's correct responses; helps learner correct wrong or partially correct responses

If goal is reached, shows enjoyment of learner's accomplishment

If goal is not reached, assists learner in improving responses or, if situation demands, discusses possibilities of substitute or modified goal

FIGURE 1.2.

without further effort. The frustration resulting from not knowing this one word may not be sufficiently high that she tries again or sets a substitute or modified goal.

Purposeful Learning by an Individual with Guidance

Figure 1.2 shows the sequence in purposeful learning with guidance. The person who gives the guidance may be a parent, an older brother or sister, a friend, a teacher, or any other helpful person. As the sequence is discussed in the next paragraphs, assume that a teacher gives the guidance.

Motivation is the key to purposeful learning. In the case of Mary and Bill there was already motivation—for Bill to ride the bicycle and for Mary to recognize the word "crucial." In this instance the first job of the teacher would be to help each set a realistic goal in connection with the learning task. If, for example, Bill wanted immediately to ride expertly, the teacher's job would be to help him set a less high level of skill for the immediate future. In most school situations, however, an important task of the teacher is to decide what is important for pupils to learn and to ascertain what they may be ready for. Then the next step is to arrange the situation so that the pupil wants to learn. If pupils want to learn, promises by the teacher of concrete or symbolic rewards and punishments are not needed as incentives.

The teacher's helping Bill to appraise the situation might take many forms. The teacher should arrange the initial bicycle-riding lesson so that Bill has maximum opportunity to appraise the elements of the situation. Among other things the beginning instruction should start on a smooth, level surface rather than a rough, slanting surface. The foot pedal should be in an up and slightly forward position, and Bill should know that this is the best position for starting. The seat and handle bars can also be properly set for Bill. In this appraisal of the situation, the teacher can help Bill understand through verbal instructions and actual demonstrations.

If Bill is impatient to ride the bicycle, the teacher will probably allow him to make the first tries without much instruction. As he fails or achieves only moderate success, Bill may be ready to accept assistance. If the bicycle always falls when he tries to start, the teacher can then talk, demonstrate, and actually steady the bicycle from the rear as Bill starts.

Similarly, with Mary's attempt to identify the word *crucial,* the teacher may tell Mary to try to find out what the word might be through reading the whole sentence or paragraph. Mary might be helped in dividing the word into syllables, or the teacher might tell her that "ci" is often pronounced as "sh." If Mary can use a dictionary, the teacher might give her one and help her to get the correct pronunciation by using it.

From the preliminary trials until the goal is reached, the teacher helps the learner apply previous learnings to the present situation. With Bill, for example, the teacher might point out that he should have his foot pedal in the same starting position that he used on the tricycle. The teacher might suggest to Mary that she can divide "crucial" into syllables as she has already learned to do with other words. In any purposeful learning wherein the learner cannot himself decide readily whether a response is correct or efficient, the teacher can be very helpful by reinforcing the learner's correct or more efficient responses and by correcting the wrong and less efficient. Reinforcement is usually verbal and accomplished by saying "That's right, That's good, Correct," and so on. The teacher must know what the correct responses are and observe and reinforce them immediately. The greatest possibility for the improvement of all human abilities seems to lie at this point, inasmuch as many learners are eager to learn. Too often they are not helped to identify correct or efficient responses, and more often they are not helped in overcoming incorrect or inefficient responses quickly so that they can move on to higher levels of performance. When a mistake or incorrect response is made, the learner should be helped to overcome it. It is not enough simply to tell him that his response is incorrect or wrong. It is, for example, quite useless to tell a child that he writes too slowly or illegibly or to say to Mary and Bill that they must do better. Even in high school and college, the teacher's giving a test and informing students that they have made mistakes or errors is a limited form of help.

If Mary and Bill reach their goal with guidance, the role of the teacher is to express enthusiasm and enjoyment about their accomplishments. Subsequently the teacher may help each of them set an appropriate higher-level goal. Consider the possibility that Bill is too small to ride his bicycle and may not be able to ride it for some months. Upon ascertaining this, Bill is likely to become frustrated. Here again the role of the teacher is critical. At this point the helpful teacher encourages him to continue on the tricycle for a while longer and assures him that, periodically, they will try the bicycle again.

In general, teachers show their enjoyment of the learner's accomplishments. However, we seem not to have considered seriously how to help learners who have repeatedly experienced failure after doing their best in our classes. Many children and young people have tried hard to achieve but for one reason or another have fallen short of their (and our) goals; after failing, they have quit trying. It is entirely possible that, instead of quitting, such students might have deferred the more difficult activity for a while had the teacher been able to substitute an appropriate one of lesser difficulty and had he given them encouragement when they most needed it.

Purposeful Learning in a Group Situation with Guidance

In dancing, in instrumental music, in dramatics, and in other fields, parents often provide a tutor for their child. In a few fields in a few elementary and secondary schools, students are occasionally given individual instruction. This sometimes happens in instrumental music, in organized athletics, and with handicapped children—speech correction, physical therapy, and the like. Very few teachers, however, spend the entire school day working with one child at a time. The general pattern is for a teacher to work with classroom groups of twenty to forty pupils and at times during the day to give some instruction to individuals. Recently, however, class size has been greatly increased and it is not uncommon to find lecture classes of two hundred or more students in some large high schools, colleges, and universities. Educational television and radio programs are reaching thousands of persons simultaneously.

Figure 1.3 illustrates the teacher's role in implementing purposeful learning in a group situation, but it is applicable only to smaller groups with class size from about fifteen to forty. It is not applicable to any situation in which the teacher feels that it is the responsibility of the pupils to learn as best they can from listening to and seeing the teacher in action.

Imagine now a situation in which the teacher's objective is to help pupils learn to spell correctly. There are thirty pupils in the class. As to motives, assume that the pupils are active and want to learn something. It is entirely possible that most of them want to spell better, but not all can learn the same number of words at the same rate. Also, some may not want to improve their spelling. In this situation, the teacher feels that, regardless of the pupil's immediate desires, she has the responsibility for helping them to improve their spelling. It is her further responsibility to assess what each pupil already knows in spelling and to assist the entire group in recognizing the value of correct spelling. Often the teacher leads a whole class discussion and brings in concrete materials and resources to help the learners understand some of the values of correct spelling. Once the pupils want to learn to spell, the next task is to help them set appropriate goals. Since not all pupils can learn the same number of words efficiently, the teacher individualizes instruction or divides the class into smaller groups in such manner that each pupil gets new words in proper number and of appropriate difficulty. Further, once the pupils feel the need to spell correctly, and as the teacher makes it possible for them to engage in writing activities, each pupil will learn not only through the more formal instruction with word lists but also through independent, purposeful learning without much help from the teacher.

In the group situation each learner perceives the situation from his frame of reference. With fairly adequate teacher procedures as described in the preceding paragraph, most pupils will accept and internalize the need to improve in spelling. The teacher also perceives the situation from a personal frame of reference. Looking upon improvement in spelling as a continuing objective of instruction, the teacher has already some knowledge about the number of words which might be appropriate for individuals to learn, the difficulty of various words, and the performances in spelling that

Purposeful Learning in a Group Situation with Guidance

The Pupils	*The Teacher*	*The Teaching-Learning Process*
I. MOTIVES		
The pupils are active and want to learn; not all can learn the same things at the same rate; not all set realistic goals.	The teacher wants to secure efficient learning; society places some restrictions on what are appropriate learnings in school; these are incorporated in the teacher's value system and in the school's guides.	Appropriate learnings are decided upon; pupil need for learning is established; goals are set. Instructional materials, discussions, demonstrations and other activities are used by pupils and teacher in the process.
II. SITUATION		
The learners perceive the situation from their frame of reference; not all perceive it in the same manner.	The teacher also perceives the situation from a personal frame of reference and attempts to organize the immediate and long-term situation accordingly.	Common cues and guide posts are identified so that the pupils and teacher perceive the situation sufficiently clearly to proceed with efficiency. Materials and classroom activities for accomplishing this depend upon the characteristics of pupils, teacher, subject matter, and school.
III. SEQUENCE FROM PRELIMINARY TRIALS TO GOAL ACHIEVEMENT		
The pupils try out and subsequently confirm or reject their responses throughout the sequence.	The teacher knows correct and incorrect, adequate and inadequate responses; assists pupils in acquiring correct responses efficiently; reinforces or arranges for confirmation of correct responses; corrects wrong or inadequate responses.	Instructional materials and activities are arranged. Individual, small-group, and whole-class activities are organized through positive teacher leadership and active participation of pupils. Acquisition and use of new learnings proceed.
IV. FINAL EVALUATIVE ASPECT		
The pupils judge their performances as adequate or inadequate and subsequently experience feelings of success or failure.	The teacher judges the results of teaching as adequate or inadequate and subsequently experiences feelings of success or failure.	Mutual satisfactions are felt as successes are achieved on a daily, weekly, or longer basis. If learners do not reach goals or make progress toward them, frustration ensues for both teacher and pupils. Subsequently, behaviors of pupils and teacher which led to lack of progress are identified and overcome.

FIGURE 1.3.

might be reasonably expected of the learners in the particular group. In all fields of instruction at all school levels, teachers tend not to realize that many pupils do not perceive the teaching–learning situation as does the teacher. Too often teachers assume that the pupils are as highly interested as the teacher. Also, the teacher often has the objectives and subject matter for the entire semester or year clearly in mind, but does not realize that pupils often do not know where they are going, except on a day-to-day basis, unless the teacher informs them.

In the teaching–learning process from the preliminary trials to achieving the spelling goals the pupils try out and subsequently confirm or reject certain spellings with teacher guidance. Knowing correct and incorrect responses, the teacher assists them in acquiring the correct responses efficiently and in overcoming immediate or habitual errors. Here, too, the teacher has the responsibilities of making sure that the materials such as textbooks, writing pads, and other materials needed are available; of arranging either formal instruction in spelling, using graded word lists, or informal instruction in connection with writing activities, or a combination of both; and also of taking appropriate action as necessary for individualizing instruction, dividing the classroom group into smaller groups, or treating the class as an entire group. A considerable amount of teacher–pupil discussion and of teacher–pupil planning are often carried out because most teachers cannot always decide what might be the most appropriate activities for various pupils. Through classroom discussions and planning sessions, the pupils themselves can give the teacher some assistance in deciding what might be appropriate instructional activities and materials. And equally important for efficient learning, it is imperative that the pupils look with enthusiasm toward the proposed use of instructional materials and the carrying out of activities. In most situations, this enthusiasm can be generated if the learners share in discussing what they will do, and why, when, and how they will do it.

In the final evaluative aspect of the sequence each pupil perceives his performance as adequate or inadequate and subsequently experiences feelings of success or failure. The teacher likewise perceives the results of teaching as adequate or inadequate and subsequently experiences feelings of success or failure as a teacher. In the teaching–learning process experienced by the pupils and the teacher, mutual satisfactions are felt if the evaluative aspect is satisfying to everyone. If, however, frustrations emerge, these are analyzed in order to identify the conditions associated with the materials, the activities, the teacher's methods, or the pupils' methods which resulted in lack of progress and frustrations. When learners do not make progress toward reasonable goals and the teacher recognizes that the goal of achieving efficient learning is not being reached, appropriate actions are taken to overcome the difficulties.

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Learning Through Identification and Imitation

We do not know the age at which the infant attempts to learn with conscious purpose. We do know that the young child by age eighteen to twenty-four months has already learned many behaviors through imitating those about him. By the time children enter the first grade, girls already exhibit definite feminine behaviors and boys definite masculine behaviors. These feminine and masculine behaviors in part result because the child identifies with the parent of his own sex and imitates the total sex behaviors of the person with whom he has identified. In the elementary grades also, children identify with the teacher, with someone read about in a book, with someone seen and heard on television, and the like. High school boys and girls often admire very strongly an age-mate, an older classmate, a teacher, a person read about, a person listened to, or a person seen and heard on television. In turn, the total behaviors of the admired person as perceived by the adolescent are imitated and incorporated into his behavior pattern. Young adults, too, often identify with older persons or with others whom they admire and with groups and institutions. The college student, for example, identifies with the sorority or fraternity, with a class such as freshman or sophomore, and with the institution he attends.

The development of a person as a civilized human being is in part a process of increasing his identifications with the world about him. Over a period of many years from childhood into early adulthood, each person learns about himself as a self and his relationships to other people and institutions largely through identification. Once a person has identified with another, he imitates and tries to live up to the attitudes, values, and emotional patterns of the one imitated.

Consider, for example, how one after another fad catches on and carries through with high school students. Vast numbers of high school students watch television and observe a singer who catches their fancy. Individual students listen to the song and perhaps try to sing it themselves. With modern promotional techniques, thousands of high school students throughout the country are soon buying records of their star. And shortly thereafter the students are cutting their hair like the star, wearing clothing similar to the star's, and perhaps using the same facial expressions or body contortions. Further, if the star has indicated preferences for certain foods, cosmetics, or other products, the adolescents buy the products. These students did not purposefully set out to learn the particular behaviors that are now part of their behavior repertoire nor to buy the particular products. Also, being unaware of the identification and imitation processes, they do not realize that they are changing their behaviors markedly without having consciously intended to do so.

There is, of course, much imitation in purposeful learning with guidance. The teacher properly anticipates that the learner will imitate the demonstration of typewriting, dancing, handling a microscope, or whatever is being demonstrated. To the extent that the learners accept the teacher as a desired and admired person, that strongly will they imitate. Teachers must be aware that they are models or identifying figures. An admired teacher's attitudes, values, emotional expressions, and actions are imitated. Those of a strongly disliked teacher are not imitated but rejected.

Learning Through Being Conditioned

The training of lower forms of animals to perform various actions or tricks is largely accomplished through conditioning. Figure 1.4 provides a model for one type of conditioning. The subject (including human subjects) being conditioned first hears a bell. This stimulus, S_1, brings forth a response of curiosity or awareness, R_1. Immediately after the bell is rung, a beam of light, S_2, is directed toward the subject's eye. Pupillary contraction is the automatic reflex or response, R_2, to a bright light being directed toward the eye. The subject does not know when the pupillary reflex occurs, since it is automatic. After a number of such presentations of the bell followed almost immediately with the flashing light, the subject is then presented with only the bell. The pupil of the eye contracts with the ringing of the bell even though no light is used. After a series of sessions in which the subject is first presented the bell, then the light, and subsequently only the bell, the subject has pupillary contractions with the ringing of the bell. He has now acquired a conditioned reflex or conditioned response, as shown toward the bottom of Figure 1.4. The ringing of the bell leads to contraction of the pupil whereas previously it had not.

With the young child the pattern of conditioning is somewhat similar. When he reaches toward the television set, the parent says "Don't," but the child does not understand and touches it. Subsequently the parent says "Don't" and smacks the young child's hand. Soon the child associates "Don't" with the unpleasant stinging on the hand and, unless the television is more attractive than the stinging of the hand, ceases to put his hand toward the television set at the command of "Don't." The command "Don't" leads to the same response now as did the slap previously. It should be noted, however, that human beings constantly weigh the effect of the punishment with the desirability of the activity. Boys and girls of school age will often take some form of punishment rather than discontinue a particularly attractive activity. In this case, the conditioning does not work.

A second example of conditioning shows the positive rather than the negative. A child hands in written work. The teacher looks it over and says "That's fine" and puts an *A* on the paper. After this has been done several times, there is no longer need to say "That's fine"; the *A* takes the place of the words. Further, the child thus conditioned may work hard to receive more *A*'s. Positive conditioning with rewards is usually more effective than negative conditioning through the use of punishment.

Now examine a more direct form of conditioning that has most undesirable outcomes. Suppose that a teacher has the pupils in her class say, "George Washington told many lies." She has them say it in unison, and each time they repeat it she says "Excellent" and smiles. Then she calls on Johnny to repeat the words. Johnny cannot do it, so she says to him and the class, "That's too bad, Johnny; you are not a good listener." Thereupon she has the whole class repeat the sentence two more times, while she smiles and says "That's good." Subsequently, three or four individual children are called upon who state it perfectly, with the teacher saying "That's a good boy" or "That's a good girl." If the teacher carries this process out for a few minutes daily over an interval of a few weeks and if the children have no different information, they will firmly believe that George Washington told many lies. Further, upon later reading that Washington was truthful and had a reputation for telling no lies, they will be put in a conflict situation, for at this time they cannot accept the new information that Washington was truthful and yet keep their desirable image of the pleasant and happy teacher who conditioned them to believe that George Washington told many lies.

Schematic Presentation of Conditioning Process

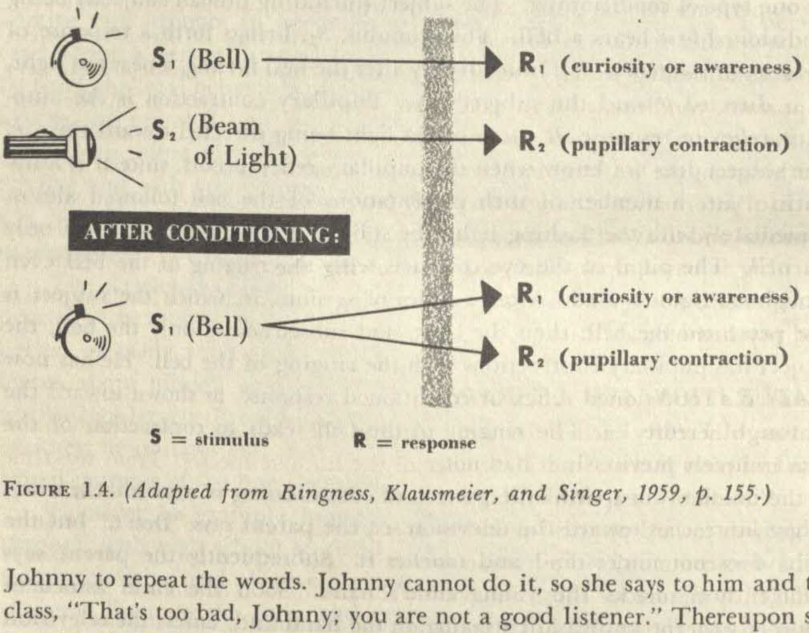
S₁ (Bell)
R₁ (curiosity or awareness)
S₂ (Beam of Light)
R₂ (pupillary contraction)
AFTER CONDITIONING:
S₁ (Bell)
R₁ (curiosity or awareness)
R₂ (pupillary contraction)
S = stimulus
R = response

FIGURE 1.4. *(Adapted from Ringness, Klausmeier, and Singer, 1959, p. 155.)*

Perfectly meaningless but accurate information can also be taught by conditioning. An admired teacher could have first-grade children say the letters "t-a-r-i-f-f" and then tell them the word is "tariff." The teacher then smiles or otherwise reinforces the particular sequence of letters and the pronunciation every time it is made. If this process is repeated often enough, the children will parrot the spelling and pronunciation correctly, without having the slightest notion of what the word means or even that they are spelling.

To relate conditioning to purposeful learning as outlined previously, the reinforcing of correct responses by the teacher may serve as a form of conditioning or as a means of helping learners confirm correct responses. If the pupils have acquired the learning with some meaning and with purpose, the teacher's saying "That is correct" or "That is good" serves as a confirming experience for the pupil rather than as a conditioning agent. However, as the teacher reinforces correct responses or punishes incorrect responses, some conditioning usually occurs, even in purposeful learning. But, very important, conditioning can take place without any purpose on the part of the learner to acquire the conditioned responses. In the example of Washington, the learners had no purpose whatsoever in acquiring the untruthful information, though they may have wished to receive the teacher's approval and to avoid her disapproval while being conditioned. Conditioned learning is based upon the goal of receiving the reward or avoiding the punishment, not upon the goal of acquiring new or higher-level cognitive and psychomotor abilities.

MATURATION AND LEARNING

Through heredity each individual acquires the characteristics which make him uniquely human and a member of the human species. From the time of the union of the sperm and egg cell, the determiners of rate and direction of growth toward physical maturity as a human being are already present. Behaviors common to the human species emerge only when the organism is sufficiently mature for those behaviors to be possible. The changes that occur between conception and birth are largely, if not totally, the result of growth and maturation. Other behaviors common to the human species emerge after birth and include prehensile grasping, sitting upright, walking upright, hopping, skipping, and many others. With the changes in the primary sex organs that come from maturation, there is also considerable change in the adolescent's behavior which is not possible prior to such maturation.

Growth refers to the increase in size or mass of such structures as the muscles, skin, glands, bones, nerves, brain, and the like. Longer arms, larger muscles, a larger heart, and increased mass of brain are products of growth. *Maturation* is a more inclusive term and results not only from growth, but also from integration of the various body structures. When the infant has grown sufficiently, the eventual integration of the bony–muscular structures and of the sensory organs of vision and balance enable the child to take the first step. As growth proceeds and further integration occurs, the child runs, jumps, hops, and skips. These are all behaviors common to the human race, and unless an individual has some sort of handicap, he will engage in them. These behaviors which make the human species different from other species emerge in the maturational process, infancy into adulthood.

The relationship between maturation and learning is exceedingly difficult to ascertain in actual practice. One cannot say readily that even upright walking, though heavily dependent on maturation, does not involve some learning. Though the young child walks upright, it is possible that, had he been completely separated from other human beings without the opportunity to observe others walk, his eventual walking might be greatly delayed or perhaps might not occur at all. In the development of language, also, the infant goes through an identifiable progression in making the various sounds which lead to the first words spoken clearly. Theoretically, maturation determines the earliest point in life at which the child will speak his first words clearly and distinctly. However, the particular words which he first speaks are clearly learned. For example, if a child is born in Russia, he goes through an early sequence of sound-making similar to that of the child born in the United States; the Russian child, however, says his first words in Russian, whereas the child in the United States says his first words in English.

Though the exact relationship between maturation and learning in the emergence of certain behaviors cannot be finally ascertained, it has been clearly demonstrated that practice or training in various behaviors such as walking and talking prior to the time the individual is sufficiently mature to engage in them is not only wasteful of the child's and the teacher's energy but also may lead to subsequent difficulties for the child. Giving the infant formal practice in walking with supports before he is maturationally ready to walk does not lead to earlier walking. Trying to get the infant to speak words before he is sufficiently mature to speak also does not lead to earlier or better speaking. Attempts to have the child learn to read, to write, or to spell before he is sufficiently mature intellectually to perform these tasks also does not lead to success for the teacher or for the child. Further, if the teacher punishes, reproves, or otherwise makes the child feel insecure for not performing a task of which he is incapable, the child may develop unfavorable attitudes toward himself, and others, and the task.

As too early education or enforced practice does not achieve desirable results, so also there appears to be a proper time in the maturation of each child when he can learn certain things most efficiently. Delaying instruction results in less efficient performances. In vocal music, for example, it appears that while the vocal structures within the child are growing, good instruction and practice at this time, and not later, help to shape the direction of the integration of such structures. With good instruction, a child at about eight to ten can develop his voice in a manner that could not be incorporated if the instruction were delayed until age sixteen or twenty. Most outstanding vocal and instrumental musical performers, as well as great mathematicians and scientists, started to develop their abilities relatively young.

Much is yet to be learned about the level of physical maturation needed for most children to engage successfully in such activities as swimming, typing, playing a musical instrument, and the like. Much more information is needed to ascertain the level of cognitive abilities requisite for the child to understand the number system or to perform a variety of mathematical computations. To promote efficient learning, the teacher cannot afford to delay instruction until a child has reached some arbitrary chronological age. Instead, a best estimate should be made of what the child might do and then tried. If the task proves too difficult, wait for further maturation or provide a less difficult task. In most of the cognitive abilities, children seem to need considerable stimulation and opportunity to advance above their present levels. Certainly, when children have little or no opportunity to speak words, they will not be able to read the words which they cannot speak; and if they cannot read, they will not be ready to spell. A fine balance is necessary between providing sufficiently difficult tasks to promote interest and activity and providing sufficiently easy tasks whereby children experience success.

FACTORS AFFECTING EFFICIENCY OF TEACHING–LEARNING PROCESSES

Consider the classroom, the laboratory, the gymnasium, or other place as a behavioral setting in which learning is to take place efficiently. What factors might lead to inefficiency in one situation and to efficiency in another? The main components broadly discussed but not made explicit in the previous sections are the pupils or learners, the teacher, the behaviors of the pupils and teacher in the situation, the characteristics of the pupils and teacher as a group, the physical characteristics of the behavioral setting, and forces outside the setting such as the home and the neighborhood of the pupils and other forces such as other educational personnel, the administrative organization of the school, curriculum requirements, and the community support of the school. More details about the six main factors are shown in Figure 1.5. Examine it carefully to get an overview of the total situation, and then study the few explanatory paragraphs which follow. The main factors are treated more fully in the remainder of the book.

The behavioral setting for school learning might be a college auditorium with three hundred or more students in an introductory science course, or it might be a specially equipped room for eight to ten orthopedically handicapped children. It might be a swimming pool, a physics laboratory, or a music room. It might be the counselor's office or the psychologist's office. It might be in a small rural or a large city school. Behavorial setting is

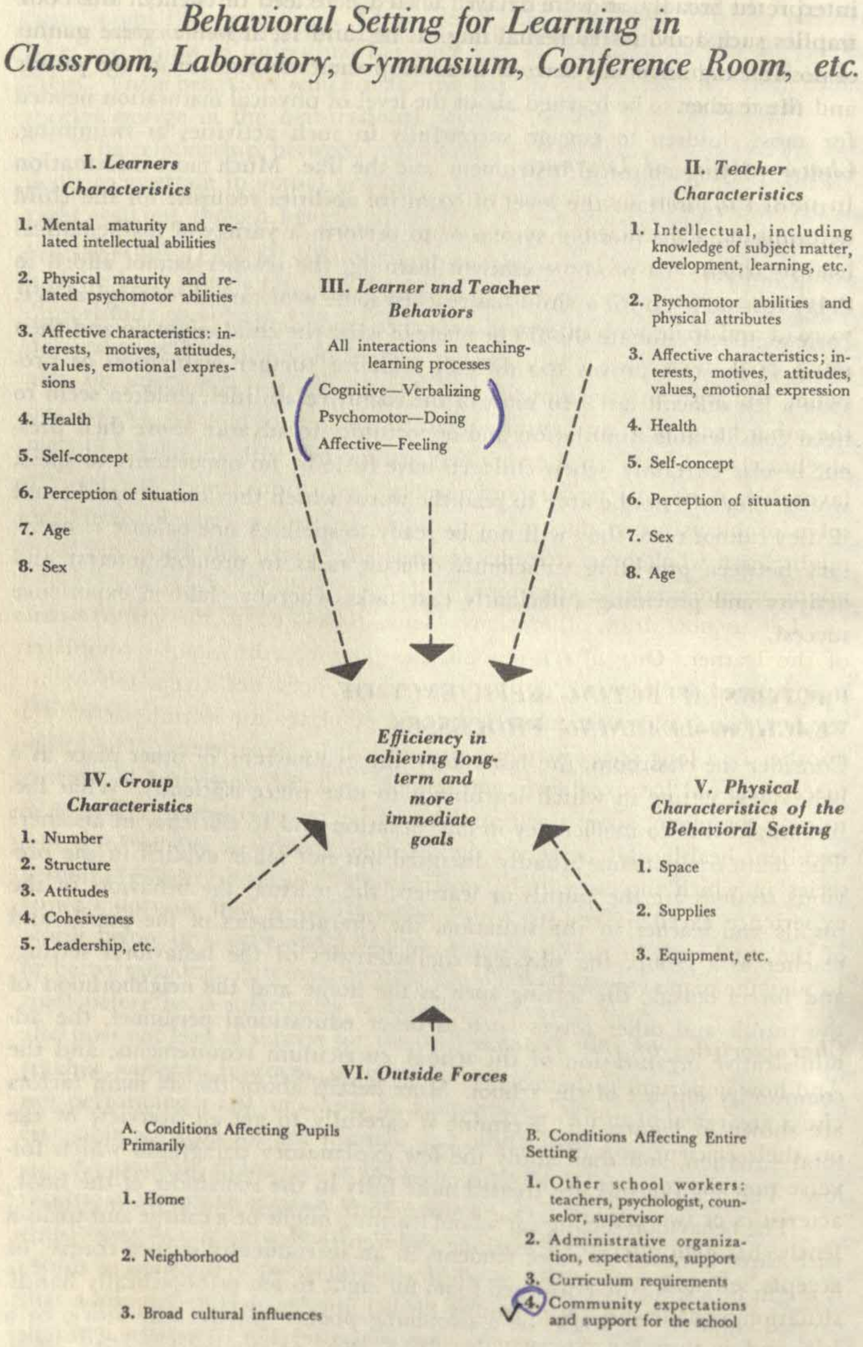
Behavioral Setting for Learning in Classroom, Laboratory, Gymnasium, Conference Room, etc.
I. Learners Characteristics
1. Mental maturity and related intellectual abilities
2. Physical maturity and related psychomotor abilities
3. Affective characteristics: interests, motives, attitudes, values, emotional expressions
4. Health
5. Self-concept
6. Perception of situation
7. Age
8. Sex
III. Learner and Teacher Behaviors
All interactions in teaching-learning processes
Cognitive—Verbalizing
Psychomotor—Doing
Affective—Feeling
II. Teacher Characteristics
1. Intellectual, including knowledge of subject matter, development, learning, etc.
2. Psychomotor abilities and physical attributes
3. Affective characteristics; interests, motives, attitudes, values, emotional expression
4. Health
5. Self-concept
6. Perception of situation
7. Sex
8. Age
Efficiency in achieving long-term and more immediate goals
IV. Group Characteristics
1. Number
2. Structure
3. Attitudes
4. Cohesiveness
5. Leadership, etc.
V. Physical Characteristics of the Behavioral Setting
1. Space
2. Supplies
3. Equipment, etc.
VI. Outside Forces
A. Conditions Affecting Pupils Primarily
1. Home
2. Neighborhood
3. Broad cultural influences
B. Conditions Affecting Entire Setting
1. Other school workers: teachers, psychologist, counselor, supervisor
2. Administrative organization, expectations, support
3. Curriculum requirements
4. Community expectations and support for the school

FIGURE 1.5.

interpreted broadly, and "behavior" as used here and throughout the book implies such activities as verbalizing, doing, and feeling–the entire gamut of possible cognitive, affective, and motor processes engaged in by the pupils and the teacher.

Characteristics of Learners

In most situations the characteristics of the pupils are most important in determining the efficiency of learning. Almost nothing can keep bright, healthy children from learning something. Put ten bright six-year-olds in a room with appropriate reading and writing materials, and they will learn to read and write without much assistance from anyone. If put in a swimming pool, none will likely drown; rather, they will probably learn to swim. But with an excellent teacher, they learn much more efficiently. On the other hand, put ten mentally retarded students of high school age in an algebra class. Even with the very best teacher and with all other conditions favorable, none will understand algebraic equations, much less learn to solve problems using algebraic equations. In a shop class, however, they might learn wholesome attitudes toward self, others, and work, and many might acquire a salable vocational skill.

Let us now draw other sharp contrasts related to the characteristics of the learner. One fifteen-year-old has poor coordination, is completely uninterested in learning to play the piano, does not accept self or the teacher, has a cold with a low fever, and perceives the learning activity as another in a long series in which failure will be experienced. The second fifteen-year-old has excellent coordination, is highly interested in learning to play the piano, accepts self and the teacher as worthwhile persons, is in excellent health, and perceives the learning activity as another in a long series in which success will be experienced. The same teacher who will experience excellent results with the latter pupil will not, unless each of the conditions of the first pupil can be changed, be able to teach him to play the piano very well.

Characteristics of the Teacher

And how important is the teacher? In most situations, the teacher can exercise a great deal of influence on the personal lives of the learners as well as on their efficient acquisition of cognitive and psychomotor abilities. Reverse now the contrast of the fifteen-year-olds to apply to the personal characteristics of two teachers. One knows music exceedingly well, sings excellently, has high interest in teaching children to sing, is in excellent health, accepts self and the pupils as worthwhile persons, and perceives in this situation a challenging opportunity for helping learners develop their abilities and, in turn, for experiencing success as a teacher. The second teacher knows little music, sings poorly, and so on. Unless the pupils are unusually well behaved and have a burning desire to sing, they will not profit from instruction with the second teacher but will with the first.

Learner and Teacher Behaviors

The third group of factors affecting efficiency of learning includes the pupil and teacher behaviors. Each pupil and each teacher have certain characteristics. These characteristics can be fairly well ascertained. However, from ascertaining the pupil's and the teacher's intelligence or already acquired abilities in reading, for example, we cannot yet adequately predict or infer the behavior of each in the behavorial setting. There is a sufficiently close relationship between intelligence and subsequent performance in mathematics, for example, that we can make some broad but not completely reliable predictions as to how the pupil and teacher will behave or interact in the instructional program in mathematics. In determining the efficiency of learning mathematics, the more immediate behaviors of the teacher and the individual pupils in the behavioral setting are as important as or more important than their personal characteristics. Note that these behaviors are roughly classified in Figure 1.5 as (1) cognitive with the main emphasis on verbalizing, (2) psychomotor with the main emphasis on doing or acting, and (3) affective with the main emphasis on feeling and expression of feelings. This is schematic; the behaviors are much more comprehensive and include all the cognitive, psychomotor, and affective processes, as partly delimited previously in Figures 1.1, 1.2, 1.3, and 1.4. What the pupils say, do, and feel is important; what the teacher says, does, and feels is important; and the interactions or transactions between the pupils and the teachers while saying, doing, and feeling largely determines the emotional atmosphere of the setting as well as the efficiency in achieving the goals. As stated previously, the saying, doing, and feeling and the interactions are related somewhat to the characteristics inherent in the pupils and the teacher; these characteristics set some limits upon the saying, doing, and feeling.

Professional competences also are important in guiding the teacher's behaviors. The teacher with the desirable personal characteristics, as shown in the previous example, may be an excellent vocalist and highly interested in teaching the pupils but might not know how to go about it well. A second teacher might also have the desirable personal characteristics and, because of additional education and previous experience in teaching, be able to manage the physical environment, personal relations with the pupils, motivation, practice, and the like more efficiently.

Looking at the long-term objectives and the more immediate goals in the above situation, we can readily see that when both the teacher and the pupils set the same immediate goal—the pupils to sing better and the teacher to assist in the process—a better learning environment is immediately present. Further, when the pupils have set the longer-term objective of becoming good vocalists and the teacher has also set the longer-term objective of getting satisfactions in the process of helping the pupils, the more immediate behavioral setting is improved and the possibility is much greater that the pupils and the teacher will profitably continue the arrangement over a period of time.

Group Characteristics

The fourth main factor in Figure 1.5 is designated "group characteristics." A group may be merely a collection of individuals. For example, if twenty-five or thirty college students who do not know one another meet for the first time in a classroom, the particular group at that point has no structure or cohesiveness and has not yet generated common group attitudes. These same students, however, may come to know one another well; and small groups may form within the larger group, in which case there will be a group structure. Further, if they consider themselves members in the sense that the players on a basketball or football team do, definite group attitudes and cohesiveness will emerge. If the teacher is at all concerned with helping students acquire social attitudes and skills, she may encourage this group formation so that it develops in a relatively short time.

Think now of two classroom groups. One is characterized by several cliques. That is, a class of twenty-five to thirty pupils is informally arranged into smaller groups, and each of these smaller groups operates quite independently of the other groups. Further, one of the cliques is a minority group. The majority group does not interact at all with the minority group. Another clique is composed of four or five students from wealthy homes; these four or five associate only with one another and no one else. Still another clique is composed of four or five students from low socioeconomic status. They, too, associate among themselves but not with others. Similarly, the rest of the class is arranged in two or three other cliques. A contrasting classroom group would be one in which all the students know one another, accept one another, and associate freely with one another. The same teacher would have a very different problem in attempting to help each of these classroom groups develop social skills and a common background of attitudes and values.

Physical Characteristics of the Behavioral Setting

A fifth main factor in the behavioral setting and the easiest to control, if adequate monies are available, is designated "physical characteristics." Although it is perfectly obvious that no one would try to teach students to play the piano without a piano or to teach swimming without available water, there is a tendency to try to teach many concepts in science, mathematics, social studies, and English without the needed space, supplies, or equipment. Again consider two contrasts. In one foreign language class there are booths with tape recorders, and each pupil may use the tape recorder to record his own voice and play it back or to listen to a recording of the teacher's voice. The tape recorders in this room are managed in such a way that the pupil can learn on his own and use the recorder to learn at a speed appropriate to him. The teacher may use his recording to point out specific pronunciation difficulties.

In the second class no tape recorder is available. The only opportunity the student has to learn is in direct interaction with the teacher or in interaction with other learners. In the second situation it is impossible for each student to proceed at his own rate or to hear himself. The possibility for efficient learning is less in the latter situation. Similarly, if a group of thirty pupils has only twenty typewriters the possibilities of efficient learning are much less than if thirty typewriters were available.

Outside Forces

The sixth factor shown in Figure 1.5 is called "outside forces." These might readily be considered as separate forces; however, for the sake of convenience they are all grouped under one main heading to present the overview. The home, neighborhood, and broader cultural influences brought to bear on the pupil are reflected in his personal characteristics and behaviors in the classroom. These out-of-school forces often affect his attitude toward learning in school. Some children come to school eager to learn; others are much less eager or actually resistant.

Somewhat as the home and neighborhood affect the pupil, so also do other school people who work with the teacher or the pupils directly. If, for example, a school system has visiting teachers, psychologists, counselors, and curriculum supervisors who are available to help the teacher when necessary, many problems that the teacher might not be able to deal with effectively can be overcome.

The administrative organization of the school, too, may influence the behavioral setting. If the school day is divided into seven class periods and students attend seven different classes with instruction from seven different teachers, it is entirely possible that no teacher will know any student very well. On the other hand, if one teacher has a small group of twenty-five or thirty pupils in a multiple-period or homeroom class for two periods a day, at least that one teacher in the school can know and understand each pupil in the class quite well.

Curriculum requirements placed upon teachers vary widely among schools. In some schools teachers are required, regardless of the ability of their pupils, to complete or "cover" a certain amount of material from the recommended textbook each day. In a larger school system one ninth-grade class has students of low intelligence, whereas in another class there are students of exceptionally high intelligence. Yet, by a curriculum prescription, both classes are required to use the same textbook, and the teachers are expected to "cover" the textbook material at the same rate of speed. Such rigid curriculum prescriptions, of course, greatly influence the efficiency of pupil learning.

Communities also vary in expectations and support of the school. In some communities most of the parents expect their children to behave decently and work hard in school. In other communities the parents treat the school as a place to send their children to get them out of the way; they do not have high expectations for the school nor do they encourage their children to work hard or even encourage the idea that hard work and consistent effort in school are wise. These and other community attitudes impose some limitations upon what and how efficiently the students will learn.

SUMMARY

Human abilities are of two main types: cognitive and psychomotor. Cognitive abilities are combinations of such mental processes as perceiving, integrating, and generalizing, with such contents as figural, symbolic, and semantic. The outcomes of learning associated with these abilities are facts, concepts, and intellectual skills. Psychomotor abilities are combinations of such physical factors as strength, impulsion, speed, precision, coordination, and flexibility, with such contents as bodily manipulation and object manipulation. The outcomes of learning associated with these psychomotor abilities are motor sets and skills as shown in running, drawing, handwriting, typing, singing, and the like. In many school learning tasks, both cognitive and psychomotor abilities are used simultaneously. Further, the improvement of cognitive and psychomotor abilities is influenced by affective components, e.g., feelings toward self and others, attitudes and values, and interests.

A person acquires outcomes in the cognitive, psychomotor, and affective domains by means of purposeful learning, learning through imitation and identification, and learning through being conditioned. The role of the school and of teachers is to facilitate these learning processes. Efficiency of learning any outcome in a group situation such as the classroom is dependent upon the abilities and characteristics of the pupils, the abilities and characteristics of the teacher, interaction among the pupils and the teacher, the characteristics of the group, the physical characteristics of the setting, and outside forces, including those which affect the pupils, the teacher, and other characteristics of the classroom setting.

QUESTIONS AND ACTIVITIES

1. (a) Define ability and an outcome of learning.
   (b) Discuss the relationship between achieving outcomes of learning and improving human abilities.

2. (a) Define learning.
   (b) In what respects do purposeful learning, learning through imitation and identification, and learning through being conditioned differ?
   (c) Give two examples of outcomes you have acquired by each process.
3. (a) Define cognitive abilities and give two or three examples.
   (b) Give ten specific examples of learning outcomes which require students of the age group in which you are most interested to use these cognitive abilities.
4. (a) Define psychomotor abilities and give two or three examples.
   (b) List the five psychomotor activities that you can presently perform most efficiently.
5. Describe how affectivity is related to one learning outcome you have acquired in the cognitive or psychomotor domain.
6. Describe the role of the teacher in guiding a purposeful learning activity for a single child. For a group of 25-30. For a group of 100 or more.
7. (a) Define growth and maturation.
   (b) Discuss the relationship between maturation and learning.
8. (a) Arrange the six factors which affect the efficiency of teaching–learning processes in a college setting in the order of their influence, from highest to lowest.
   (b) Arrange the same six factors for an elementary or high school setting.
   (c) Describe conditions under which the factors placed at the top and bottom of your list in (a) or (b) might be reversed.

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Chapter 2 Educational Objectives and Learning Efficiency

Why are children and youth sent to school? Why are an ever-increasing number of young people attending college and university? What do the people who support education want young people to learn in school? What do the children and youth themselves want and need? These questions imply long-term objectives as well as immediate goals. They also imply values. As was shown in Chapter 1, purposeful learning by an individual always involves goal setting. Purposeful education of children and youth in school also requires clear-cut objectives. Those responsible for education at any school level cannot escape asking, "What is of most worth for the students to learn?" Educational psychology can help to answer this question mainly by providing some information and some methods for ascertaining what learners at various levels of readiness can learn efficiently. Then, once a teacher and pupils have set a goal, educational psychology can provide considerable information and principles for use by the teacher in helping to achieve the goal efficiently.

The primary purpose of this chapter is to give a broad view of possible objectives in attaining efficient learning and to help the interested person learn to move from broad statements to the specific goals of classroom instruction. Several recent statements by educators (referred to in the text and at the end of this chapter) indicate what these educators believe the general objectives *should* be and specify the many specific goals for all areas of instruction.

At present there is much disagreement about what the school's objectives should be at any level—kindergarten through graduate study. We are now in a self-examination process, an agonizing reappraisal for many people. Publicly we are debating the purpose and procedures of the school; privately, many of us are concerned about our own personal goals in life and about our objectives and aspirations as a national group of supposedly civilized adults. Until more people have better answers, their personal reevaluation of the proper function of the school will continue. The eventual answer may be that the schools can and should be a more powerful force in helping individuals find self-direction and self-realization and in bringing about improvements in the social order generally (Klausmeier, 1956, 1958).

Regardless of how much individuals and groups may disagree about what should be learned in school, the teacher must decide upon objectives if learning is to proceed efficiently. In turn, these objectives must somehow be incorporated into goals of the learners. In the absence of clearly defined objectives by a school system, the teachers make the decisions themselves. In the absence of teacher objectives for the particular class, the pupils decide what to do but often do not consider of what value it is. In classroom learning the more immediate goals are best arrived at through some form of cooperative action between the teacher and learners.

GENERAL OBJECTIVES

Many teachers think of objectives related only to their particular subject matter. The professor of philosophy and the professor of physics decide upon objectives of instruction based on what they think are important learnings from philosophy and physics for students enrolled in their courses. In the process, the teacher and professor often overlook some very important objectives which they and the students might achieve.

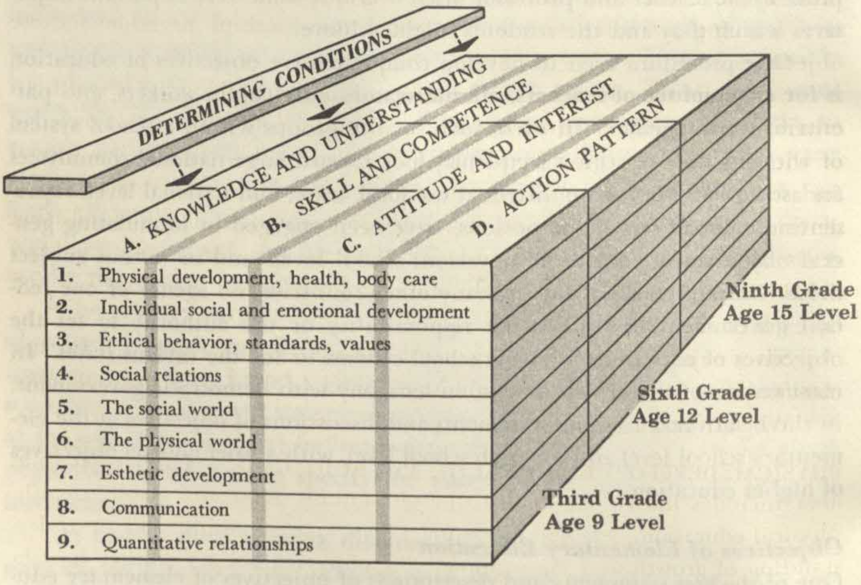
One procedure used to develop comprehensive objectives of education is for a committee of teachers, administrators, curriculum workers, and parents to work together. In turn, such smaller groups within a school system or within a state or region frequently look toward large national committees for assistance. Many committees at the local, state, and national level, representing a broad sample of persons, have been engaged in formulating general objectives of education at various school levels and in various subject fields. Unlike the situation in many other countries, no agency of our federal government has either the responsibility or the authority to set the objectives of education for local school systems or for the various states. In most respects, we feel this is wise, in harmony with democratic government.

We turn now to some statements and discussions of objectives at the elementary school level and the high school level, with a brief note on objectives of higher education.

Objectives of Elementary Education

One of the best statements and descriptions of objectives of elementary education (Kearney, 1953) was prepared by a group of persons representing the Educational Testing Service at Princeton, the United States Office of Education, the Department of Elementary School Principals of the National Education Association, and the Russell Sage Foundation. This group was called the Mid-Century Committee on Outcomes in Elementary Education. Figure 2.1 shows the objectives as organized in a three-dimensional framework. One dimension is a growth scale dividing the nine years of elementary school into three equal time units. Though the detailed objectives for each time unit are not shown in Figure 2.1, the Committee proposed objectives which might reasonably be attained by most pupils toward the end of the third, sixth, and ninth grade.

A second dimension includes the broad areas of elementary learning which are represented by the nine horizontal rows: Physical Development, Health, Body Care; Individual, Social, and Emotional Development; Ethical Behavior, Standards, Values; Social Relations; the Social World; the Physical World; Esthetic Development; Communication; and Quantitative Relationships.



The Behavioral Continuum –

Broad Curriculum Areas Intersecting Major Behavior Categories

FIGURE 2.1. *(Kearney, 1953, p. 38.)*

The third dimension gives the types of behavioral changes expected: *A.* Knowledge and Understanding, *B.* Skill and Competence, *C.* Attitude and Interest, and *D.* Action Pattern. The Determining Conditions cannot properly be called outcomes in the same sense that Knowledge and Understanding or Skill and Competence can. Instead, Determining Conditions refers to the biological and sociological context in which children, teachers, and others in the school interact. It is possible that over a long period of time, perhaps two or three generations, these Determining Conditions might also change because of more efficient pupil learning; and in this sense only may the Determining Conditions be considered outcomes similar to knowledge and understanding.

When parents or other laymen and specialists in a particular subject-matter area first encounter the objectives stated above, they are often perplexed because the objectives do not seem to fit neatly into separate subject fields. The Communication area can readily be associated with such subjects as reading, spelling, and English; Quantitative Relationships with arithmetic or mathematics; the Physical World with science and geography; and so on. The Committee, however, did not specify that the objectives had to be achieved in connection with any area of organized subject matter. Indeed, in achieving knowledge and skills in such objectives as Social Relations, Ethical Behavior, and Individual Social and Emotional Development, not only each subject area included by the school but also the many experiences between the teacher and the pupils and among the pupils are important. Further, the school through its teaching staff must organize the necessary learning activities and interpersonal relationships to achieve those objectives.

Certain of the objectives can be achieved more readily in the school than others; we can help children acquire communication skills and knowledge of the physical world, for example, more readily than healthy emotional and social development. The home and neighborhood are more powerful determinants of emotional and social development than of communication skills and quantitative relationships. Nevertheless, the school can and should attempt to help each child make progress in the directions implied by each of the nine objectives.

Since objectives are often organized and stated as in Figure 2.1, further clarification of the broad curriculum areas and of the four major outcomes in the behavioral continuum is appropriate.

PHYSICAL DEVELOPMENT, HEALTH, AND BODY CARE. This curriculum area includes individual health, the elementary aspects of public health, physical education, personal grooming, safety, sportsmanship, and an understanding of growth and maturation. The objective stresses positive health-building practices rather than prevention or remediation. As the child progresses through the elementary grades, he is to acquire knowledge and understanding, skills and competences, attitudes and interests, and action patterns.

INDIVIDUAL, SOCIAL, AND EMOTIONAL DEVELOPMENT. The objective here is to help individuals acquire and maintain good emotional health, reasonable emotional stability, and well-integrated personalities. As such, this objective is quite closely related to the previous one as well as to ethical behavior. The primary school child, in achieving this objective, should know and *understand* some of the things he does well and those he does not do so well. He should develop beginning skills and competence, for example, in giving simple directions clearly, working alone for a period of time, and working out some of his problems independently. His growing *attitudes* and *interests* should show pride in the growth of skills and a desire to be reasonably adequate in various immediate teaching–learning situations. Also, he should show interest in his own motor performances and in the performances of others. In his *action patterns,* the primary school child should begin to make minor choices, to think more for himself, and to appraise his own performances. These are only a few of the many examples of behaviors indicative of achieving the objectives which are found in Kearney (1953) for the primary age level. Now follow brief excerpts delimiting the other seven curriculum areas.

ETHICAL BEHAVIOR, STANDARDS, VALUES

> Ethical behavior, standards, and values are related to the observance of the moral law and the civil law. This area includes the observance of much that gains its validity from the customs and mores of the culture. It involves sportsmanship, kindliness, helpfulness, and the problems involved in living in a society with other people [p. 68].

SOCIAL RELATIONS

> This section grows out of the two categories just outlined: individual social and emotional development, and ethical behavior, standards, values. It is devoted to the individual as a person in his personal–social relations with others, when he has to consider the needs, interests, motives, convictions, and ideals of others with whom he associates in home, community, and place of work [p. 73].

THE SOCIAL WORLD

> This section on the social world considers the child in a somewhat broader social setting than does the preceding section on social relations. Here we set goals for the child in terms of the structure and the institutions of our culture. The behavior of the child is considered in relation to community, state and nation. Geography in its relation to man is in this background. Civics, elementary economics, government, and the traditional American way of life come in this area [pp. 79–80].

THE PHYSICAL WORLD (NATURAL ENVIRONMENT)

> In this section attention is centered on an enlarged concept of science, and reference is made to many aspects of the child's environment. Physical science problems, as well as the science that deals with plants and animals, are emphasized. Also stressed are learning to think scientifically and the use of methods of science in solving problems in science and problems in everyday living [p. 86].

ESTHETIC DEVELOPMENT

> In this section emphasis is placed on esthetic appreciation and expression. Though the primary emphasis here is on art, music, and the crafts (literature is more fully treated in the next section), many types of artistic and creative endeavor are mentioned. The moral, the intellectual, and the emotional aspects of esthetic development are all included [p. 95].

COMMUNICATION

> This large and important section covers the wide variety of means by which man communicates with man. It emphasizes the mechanical and skill aspects of reading,

> writing, composition, correct usage, spelling, punctuation, speaking, and listening. It includes use of the library and of references of various kinds. It includes group skills, such as conducting and participating in meetings [p. 101].
>
> QUANTITATIVE RELATIONSHIPS
>
> Here we find arithmetic and the elementary aspects of algebra and geometry. Here children are introduced to a great variety of measures by which man describes in quantities the things he finds in his world. This involves the ability to analyze and solve problems on the basis of the particular problem, the information needed to solve it, and how to get the information [p. 113].

Some overlapping among the nine broad curriculum areas is present; they are not mutually exclusive. Some overlapping is also found in the four areas of behavioral change: knowledge and understanding, skill and competence, attitude and interest, and action patterns. Behavioral change was meant to be conceived broadly, as it is usually viewed by psychologists, with "behavior" defined as including all the things that the human being does in thinking, feeling, acting, imagining, and the like. Kearney made explicit differentiation among the four categories of behavioral change as follows:

> [Knowledge and understanding] refer to things that are memorized, or that are understood so well that they can be easily recalled. The second column provides space for skills or competences, the skills that average children should be able to use without careful thought and planning, and the intellectual competences that children should be able to exercise in making decisions and judgments, in being resourceful, in meeting difficult problems, in examining new and difficult data, and so on. The third column provides for items concerned with the basic needs and drives of human beings—the exercise of will, the play of emotion—as these are shown in interests and attitudes. Action patterns refer to broad generalized ways of behaving, such as ways of responding to problem situations through the union of intelligence with good working habits and scientific methods of thinking.
>
> Since the schools represent only one of many forces that mold and change or limit the young learner, it was found necessary to add a fifth column, determining conditions. The factors mentioned in this column cannot properly be called outcomes in the sense that the schools and society strive to bring them about, for only occasionally and over long periods of time may some of them be indirectly affected by what goes on in the schools or the community. More than anything else, they represent the biological and sociological context in which children and the schools carry on together [Kearney, 1953, p. 36].

Whether the above objectives are completely adequate and appropriate for our many schools, communities, pupils, parents, and teachers is problematic, and perhaps a somewhat academic question. But such broad objectives, if accepted by local schools, do tend to establish some direction in which elementary education will go. Learning to speak a foreign language is not included as a broad curriculum area or as a smaller part of one. Many communities now have foreign language instruction in the elementary school. Undoubtedly many more will in the future. In any event, it is perfectly clear that, if the school does not accept as an objective having each child learn a foreign language and thus offers no instruction, the children do not learn a foreign language in school. Also, though an objective might be to develop physical skills, if the school provides no opportunity for instruction in swimming, pupils do not acquire swimming as a result of attending the school. A number of religious groups are not satisfied with the secular public schools. A primary objective of parochial schools is the transmission of denominational religious values and beliefs.

Regardless of the objective of the particular school system, efficiency of pupil learning toward achieving that objective can be ascertained only if the objective is clearly stated in behavioral terms. Efficiency of pupil learning cannot be ascertained if the objectives are not clearly stated. Much of the confusion and criticism about public, parochial, and private education comes about because the objectives are not clearly stated, or if they are, widespread misunderstanding or disagreement exists about the values implied by the objectives.

Objectives of Secondary Education

The idea that every child of school age should attend elementary school has long been accepted in the United States. Though there is now considerable agreement that every boy and girl should attend high school to age eighteen or graduation, the idea is very new in broad historical perspective. Further, what students should learn in high school and how high school education can be made worthwhile to each student are vigorously debated. Most people are convinced that students who have the ability to learn well and who will probably go on for higher education should attend high school. However, many persons, including some teachers, are doubtful about requiring uninterested or mentally slow students to remain in high school, especially because teaching conditions and curriculum arrangements in many schools are not yet satisfactorily worked out in such way that these students actually profit by attending school. We are not yet agreed about the extent to which high school education should be devoted to preparing students for subsequent college attendance, for securing jobs immediately after high school graduation, and for providing all students with a general education. Some of the more noteworthy attempts at formulating the objectives of secondary education from 1892 to the present are now given in abbreviated form.

In 1892 a Committee of Ten on Secondary Studies stated that the main purpose of secondary school was to prepare for the duties of life the small portion of all the nation's children who could profit from education up to the eighteenth year and whose parents were able to support them in school (Report of the Committee of Ten, 1893). The Committee proposed also that college admission requirements be the same as the requirements for high school graduation and that secondary schools should not serve solely to prepare boys and girls for college. Apparently the committee intended that the colleges should accept all high school graduates.

In the 1890's only a small proportion of school age youth attended secondary school, but high school enrollment doubled each decade from 1890 and thereafter until 1930. Further, at this time in our history there was a rapid shift toward greater centralization of wealth, the hours of work per week in factories were generally decreased, labor organizations became stronger, and persons generally had more leisure time. The need for more secondary schools to accommodate more unemployable young people and the need to make secondary education more valuable for students who did not intend to go to college became apparent. These changes and needs after 1890 led to the formation of the Commission on the Reorganization of Secondary Education.

The Commission's recommendations were published in *Cardinal Principles of Secondary Education,* 1918. The Commission proposed that (1) every normal boy and girl be encouraged to stay in school until age eighteen; (2) the second six years of school be specifically designed to meet the needs of pupils in the age group from twelve to eighteen; (3) free education be extended to the junior college level; and (4) education in a democracy be such as would develop in each individual the knowledge, interest, ideals, habits, and powers to find his place in society and to shape himself and society toward a better end. The seven Cardinal Principles of Secondary Education were stated as health, the fundamental processes, home life, vocational preparation, citizenship, wise use of leisure time, and character development.

Family life, citizenship, constructive use of leisure, and character development are learning outcomes that are peculiarly related to the role of education in an urban society, because in rural society the family assumes major responsibilities for them. This statement in 1918 was thus frank recognition of the fact that many of these functions previously performed by the home, and to some extent by the elementary school, should now be performed by the secondary school. The Cardinal Principles also imply that a career in a profession such as medicine or law, entered via college and university, was simply one of many useful vocations which should receive attention in the secondary school.

The Cardinal Principles received much attention from educators, and many secondary schools extended their curricular offerings mainly by adding elective courses in academic subjects and by setting up commercial, home economics, agriculture, and shop courses which students might pursue as major areas of study or as elective classes. Thus, education to prepare students for jobs received marked attention with considerable lessening of the emphasis on preparation for college.

General education received attention next as we were emerging from the depression. The Educational Policies Commission of the National Education Association (1938) stated the objectives under four main headings: Objectives of Self-Realization, Objectives of Human Relationships, Objectives of Economic Efficiency, and Objectives of Civic Responsibility. Related to each of these, a number of clarifying statements were given. The first of these is presented to illustrate the scope of these objectives:

THE OBJECTIVES OF SELF-REALIZATION

The Inquiring Mind. The educated person has an appetite for learning.

Speech. The educated person can speak the mother tongue clearly.

Reading. The educated person reads the mother tongue efficiently.

Writing. The educated person writes the mother tongue effectively.

Number. The educated person solves his problems of counting and calculating.

Sight and Hearing. The educated person is skilled in listening and observing.

Health Knowledge. The educated person undeerstands the basic facts concerning health and disease.

Health Habits. The educated person protects his own health and that of his dependents.

Public Health. The educated person works to improve the health of the community.

Recreation. The educated person is participant and spectator in many sports and other pastimes.

Intellectual Interests. The educated person has mental resources for the use of leisure.

Esthetic Interests. The educated person appreciates beauty.

Character. The educated person gives responsible direction to his own life [Educational Policies Commission, 1938, p. 50].

French and associates (1957) described each of the four main objectives in further detail to show the specific student behaviors which would result if the objective were achieved. This description was similar to that already discussed for the elementary school. The purposes in stating the objectives as student behaviors were threefold: to emphasize that high school education should lead to desirable changes in student behaviors, to provide guides as to what these behaviors should be, and to give a better basis for evaluating how well a particular high school or teacher is doing. One section of the behavioral descriptions pertaining to one subobjective of Self-Realization is now given. As you read, you may wish to decide your own progress toward this area of self-realization:

DEVELOPING BEHAVIORS INDICATIVE OF INTELLECTUAL SELF-REALIZATION . . .

IMPROVING HIS STUDY HABITS, STUDY SKILLS, AND OTHER WORK HABITS

Is skillful in securing information and in organizing, evaluating, and reporting results of study and research.

Illustrative Behaviors

(a) Decides on his purpose before planning action.

(b) Practices good study and other work habits when he has intricate thinking, reading, and planning to do.

(c) Consults some good periodicals if seeking information on political developments, foreign affairs, homemaking, scientific matters, book reviews, etc.

(d) Uses common sources of printed information efficiently; e.g., dictionary, encyclopedia, almanacs, telephone directory, *Who's Who, Readers' Guide,* and card catalog in a library.

(e) Can read all parts of a newspaper for needed information; e.g., weather reports, radio programs, amusements, business news, editorials, local, state, national, and international news.

(f) Asks questions in such a way as to secure accurate information of public services, offices, or persons likely to have special information when in need of it.

(g) Uses books, maps, globes, charts, timetables, and graphs of all kinds to find needed information.

(h) Systematizes his work in order to accomplish the things he wants to do.

(i) Constructs line, bar, and circle graphs, diagrams, pictographs, and statistical tables to express quantitative relationships.

(j) Uses the typewriter or writes well enough to meet his needs.

(k) Reads and interprets the graphs, charts, tables, road, and other maps encountered in newspapers, magazines, and other popular printed matter.

(l) Is able to draw relevant information from several sources, correlate it, make a defensible set of conclusions, and discard what is not relevant.

(m) Manifests a fair knowledge of the relative reliability of various sources of information: two or more newspapers, radio and TV commentators, consumer guides, government publications.

(n) Develops skill in noting and recording information in outline, notes, and summary statements.

(o) Uses a readily acceptable footnote and bibliographical form in identifying sources of information and ideas.

(p) Develops listening habits that enable him to gain intended meaning [French, 1957, pp. 92–93].

The Cardinal Principles of Secondary Education and the objectives as stated by the Educational Policies Commission were, until recently, the mainstays of state and local groups in developing their statements of objectives. After 1950, the purposes of secondary education were examined by many people. The most widely publicized statement during the 1950's was that of Conant. He and his associates (1959) studied a number of comprehensive high schools in the United States and made many recommendations concerning desirable characteristics. Conant stated that ". . . the three main objectives of a comprehensive high school are: first, to provide a general education for all the future citizens; second, to provide good elective programs for those who wish to use their acquired skills immediately on graduation; third, to provide satisfactory programs for those whose vocations will depend on their subsequent education in a college or university (Conant, 1959, p. 17)."

Notice that Conant accepted the comprehensive high school. He was opposed to the establishment of one high school intended for those students who will subsequently pursue higher education and another, usually called a technical high school or vocational school, for those who will not go on for higher education. Also, he favored providing good elective programs for those students who wish to use their skills immediately upon graduation in gainful employment rather than going on for higher education. Conant felt that, even with its many problems, the present American system of secondary education in attempting to achieve the three objectives was far superior to the European system of secondary education. The European system, somewhat more harmonious in a nondemocratic form of government, has proved to be wasteful of talent in that so few students receive appropriate higher education.

Conant made twenty-one recommendations for improving public secondary education and all should be studied, although not necessarily accepted, by any one interested in education from kindergarten through graduate school. Few besides Conant would agree with all twenty-one recommendations. He has been criticized for stating the objectives of general education simply as the number of years or semesters in various subjects required of all students for graduation. He did not state what students of varying intellectual abilities were to achieve through taking the subjects, presented no evidence that a seven- or eight-period day was better than one of five or six longer periods, and did not give his value system which led to many of the specific recommendations. These matters are more apparent through studying the two recommendations which follow:

RECOMMENDATION 7: DIVERSIFIED PROGRAMS FOR THE DEVELOPMENT OF MARKETABLE SKILLS[1]

> Programs should be available for girls interested in developing skills in typing, stenography, the use of clerical machines, home economics, or a specialized branch of home economics which through further work in college might lead to the profession of dietitian. Distributive education should be available if the retail shops in the community can be persuaded to provide suitable openings. If the community is rural, vocational agriculture should be included. For boys, depending on the community, trade and industrial programs should be available. Half a day is required in the eleventh and twelfth grades for this vocational work. In each specialized trade, there should be an advisory committee composed of representatives of management and labor. Federal money is available for these programs.
>
> The school administration should constantly assess the employment situation in those trades included in the vocational programs. When opportunities for employ-

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[1] Permission to quote from *The American High School Today* was granted by the author, Dr. James B. Conant.

> ment in a given trade no longer exist within the community, the training program in that field should be dropped. The administration should be ready to introduce new vocational programs as opportunities open in the community or area. In some communities, advanced programs of a technical nature should be developed; these programs often involve more mathematics than is usually required for the building trades or auto mechanics programs.
>
> . . . the students enrolled in programs which develop marketable skills should also be enrolled in English, social studies, and other courses required for graduation. Furthermore, efforts should be made to prevent isolation from the other students. Homerooms may be effective means to this end . . . [Conant, 1959, p. 52].
>
> RECOMMENDATION 9: THE PROGRAMS OF THE ACADEMICALLY TALENTED
>
> A policy in regard to the elective programs of academically talented boys and girls should be adopted by the school to serve as a guide to the counselors. In the type of school I am discussing the following program should be strongly recommended as a minimum:
>
> Four years of mathematics, four years of one foreign language, three years of science, in addition to the required four years of English and three years of social studies; a total of eighteen courses with homework to be taken in four years. This program will require at least fifteen hours of homework each week.
>
> Many academically talented pupils may wish to study a second foreign language or an additional course in social studies. Since such students are capable of handling twenty or more courses with homework, these additional academic courses may be added to the recommended minimum program. If the school is organized on a seven- or eight-period day (Recommendation 12), at least one additional course without homework (for example, art or music) may also be scheduled each year.
>
> If as school policy a minimum academic program including both mathematics and a foreign language is recommended to the academically talented pupils and their parents, the counselors will have the problem of identifying as early as possible the members of the group. It may well be that, in the next lower 10 or 20 per cent of the boys and girls in terms of scholastic aptitude on a national basis, there are a number who ought to be guided into similar but less rigorous programs [Conant, 1959, p. 57].

Though Recommendation 9 is concise and dogmatic, another recommendation provided for individualized programs for each pupil, including some possibility for academically talented students to take some work in the fine arts. Conant would not classify pupils or label various curricula or tracks such as college preparatory, vocational, or commercial. In addition, if a talented girl student, for example, had no interest in mathematics and disliked it strongly, he would not require the girl to take four years of mathematics, just as he would not require an uninterested girl or boy to take the third year of science. Conant's biases, however, are exceedingly strong for a large amount of mathematics and a large amount of foreign language. There is more disagreement with his proposal for foreign language than that for mathematics. Part of the objection to four years of foreign language probably comes because so many high school students who have taken four years of a modern foreign language cannot speak the language—they cannot communicate with people from the country whose language they have studied for four years. Further, a large number of college graduates with a major in a modern foreign language are incompetent as teachers of the language in the elementary and high schools because, despite years of study, they cannot teach children to speak the language. Not until World War II have we widely accepted having pupils learn to speak the language as an objective of foreign language instruction.

The previous excerpts from Conant and from the Educational Policies Commission suggest some of the lack of agreement concerning the objectives of high school education. Nevertheless, they positively suggest that high school education should be of value for every pupil of school age, excluding perhaps the mentally retarded, some children with serious emotional disturbances, and some highly antisocial students. To achieve this goal, many changes and improvements are needed, and they will have to come more rapidly in the future than they have during the past twenty years. Since World War II, we in the United States have had to consider for the first time seriously what can be done through education to keep us a healthy people, a leader in achieving the good things of life, lest we become a second-rate people who have lost control over the direction of change.

Objectives of Higher Education

Some colleges and universities provide only general education or education in the liberal arts. The main objective of these institutions is to provide students a well-rounded education in such fields as the humanities, the sciences, mathematics, foreign languages, and similar fields. These institutions make no attempt to provide education which would prepare students for specific careers such as teaching, medicine, law, or business. Other institutions of higher learning exist solely for the purpose of preparing students for specific careers.

A large number of colleges and universities have both undergraduate and graduate programs. Most of the state colleges and universities, as well as many private ones, make available to students a complete program of education in the liberal arts to the baccalaureate degree but also prepare students for participation in a variety of careers such as teaching, engineering, medicine, law, business, and agriculture.

The brief descriptions above show that the objectives of higher education are much more dependent upon the particular institution than are the objectives of elementary or secondary education. This situation is entirely appropriate inasmuch as nearly all children and youth are required to attend school until age sixteen to eighteen, whereas a majority of high school graduates do not attend institutions of higher learning and none are legally required to do so. The institution of higher learning thus has much freedom in deciding its educational programs. If a student does not like it, he can choose a different college. If the college feels the student does not achieve or behave satisfactorily, he is invited to leave and, if necessary, is not allowed to continue.

The objectives of teacher education have always been of some interest to many people. Since public education in the United States is again assuming the significance it had earlier in our history, more people are concerned with the objectives, programs, and procedures in teacher education. An indication of the widespread interest in teacher education was shown by the attendance of representatives of about one hundred learned societies and professional organizations at the Fourteenth Annual National Conference of the National Commission on Teacher Education and Professional Standards in 1959. Three main objectives of teacher education were widely accepted at this conference:

1. To develop a well-educated person through an excellent program of general or liberal education.
2. To help each prospective teacher become a reasonably well-trained specialist in at least one broad area of subject matter.
3. To enable the prospective teacher to acquire the knowledge, skills, and attitudes required for subsequent successful teaching, through an excellent program of professional education.

Increasingly the idea is being accepted that at least five years of higher education is necessary to prepare a teacher. In 1952 Stanford University started its five-year program for elementary teachers (Sowards, 1959, pp. 155-156). The program leads to the M.A. in Education and a teaching certificate. The work is distributed as follows:

51 semester hours in general studies, e.g., social sciences, humanities, natural sciences, foreign language, mathematics.
35 semester hours of extended general education particularly appropriate for elementary teaching, e.g., psychology, philosophy, literature, art, music, geography.
20 semester hours in a major field.
45 semester hours in professional education, e.g., educational psychology, philosophy of education, curriculum and instruction, student teaching.

The proper balance among general education, specialization in one or two subject fields, and professional education is not known at present and apparently will continue to vary among the states and the institutions within each state. Further, there ought always to be provisions for differences among the students who are preparing for teaching as well as for differences in positions they take upon graduation. But it is certain that the three objectives stated earlier are realistic; the teacher must be a well-educated person, know the subject matter well, and know how to help students learn efficiently.

AN ATTEMPT AT A TAXONOMY

If one were to go to a large school system and ask each teacher to state the instructional objectives for the year, an exceedingly long list would result, not only for the entire school system, but also in each area of subject matter. If, subsequently, the objectives were compiled for all the schools within a state, the list would become unwieldy. While it is important that the teacher and the school state objectives quite specifically, this listing of objectives in every subject-matter field is excessively cumbersome from the standpoint of conducting research in the improvement of classroom learning.

Already thousands of research studies have been done in the field of reading. Though this is the case, there is still considerable disagreement as to what factors residing in the pupil, the teacher, and the interactions between the teacher and pupil most vitally affect children's learning to read efficiently. Similarly, a vast amount of research has been done in mathematics. For the most part researchers in the field of reading act independently of those in arithmetic, and there is very little generalizing possible among the researchers in the two areas of instruction. We do not know the extent to which efficiency in learning reading and mathematics may be governed by the same principles.

To overcome this difficulty, especially from the standpoint of measuring the outcomes of high school instruction, a committee of college and university examiners with the assistance of distinguished educators constructed a taxonomy of educational objectives (Bloom, 1956). A taxonomy is the classification of data according to their natural relationship. Large libraries, for example, classify books so that the library can be used more easily. One can go into a library containing several million volumes and in a short time, by means of a catalog and other classification aids, locate any book he may desire. As the large library continues to purchase books, it has relatively little difficulty because of its classification, or taxonomy, scheme in putting new books into the proper place.

Bloom and his associates classified all educational objectives under three domains: cognitive, affective, and psychomotor. They then tried to give precise and usable definitions of each domain and subsequently hoped to get people to formulate objectives according to the three domains. They further believed that the taxonomy in the cognitive domain could be so arranged and developed that learner behaviors related thereto could be represented in a relatively small number of classes. Further, they believed the same classes of behavior might be observed in all areas of subject matter at all levels of education in school systems and classrooms throughout the United States.

The cognitive domain was defined to include all those objectives which deal with the recall or recognition of knowledge and the development of intellectual abilities and skills. Most of what children learn in reading and arithmetic, for example, and what high school students learn in science, mathematics, English, social studies are learnings in the cognitive domain—knowledge and intellectual skills and abilities.

The second part of the taxonomy is the affective domain. Learnings described by such words as "interests, attitudes, values, appreciations, emotional and social adjustment" are included in this domain.

The psychomotor domain includes the manipulative and motor-skill areas. The physical actions involved in handwriting, typewriting, playing a musical instrument, using equipment in science, making an outline map in social studies, and many others are in the psychomotor domain.

The taxonomy for the cognitive domain was completed (Bloom, 1956), but the psychomotor and affective domains were left to other committees or persons who might eventually become interested. The cognitive domain was first divided into two broad areas—knowledge and intellectual abilities and skills. Each of these two was then further subdivided. The essential elements of the classification in the cognitive domain warrant careful study.

COGNITIVE DOMAIN

KNOWLEDGE

1.00 *Knowledge*

Knowledge, as defined here, involves the recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure, or setting. For measurement purposes, the recall situation involves little more than bringing to mind the appropriate material . . . [Bloom, 1956, pp. 53, 54].

1.10 *Knowledge of Specifics*

The recall of specific and isolable bits of information. The emphasis is on symbols with concrete referents. This material, which is at a very low level of abstraction, may be thought of as the elements from which more complex and abstract forms of knowledge are built. . . .

1.20 *Knowledge of Ways and Means of Dealing with Specifics*

Knowledge of the ways of organizing, studying, judging, and criticizing. This includes the methods of inquiry, the chronological sequences, and the standards of judgment within a field as well as the patterns of organization through which the areas of the fields themselves are determined and internally organized. This knowledge is at an intermediate level of abstraction between specific knowledge on the one hand and knowledge of universals on the other. It does not so much demand the activity of the student in using the materials as it does a more passive awareness of their nature. . . .

1.30 *Knowledge of the Universals and Abstractions in a Field*

Knowledge of the major schemes and patterns by which phenomena and ideas are organized. These are the large structures, theories, and generalizations which dominate a subject field or which are quite generally used in studying phenomena or solving problems. These are at the highest levels of abstraction and complexity. . . .

INTELLECTUAL ABILITIES AND SKILLS

Abilities and skills refer to organized modes of operation and generalized techniques for dealing with materials and problems. The materials and problems may be of such a nature that little or no specialized and technical information is required. Such information as is required can be assumed to be part of the individual's general fund of knowledge. Other problems may require specialized and technical information at a rather high level such that specific knowledge and skill in dealing with the problem and the materials are required. The abilities and skills objectives emphasize the mental processes of organizing and reorganizing material to achieve a particular purpose. The materials may be given or remembered.

2.00 *Comprehension*

This represents the lowest level of understanding. It refers to a type of understanding or apprehension such that the individual knows what is being communicated and can make use of the material or idea being communicated without necessarily relating it to other material or seeing its fullest implications. . . .

3.00 *Application*

The use of abstractions in particular and concrete situations. The abstractions may be in the form of general ideas, rules of procedures, or generalized methods. The abstractions may also be technical principles, ideas, and theories which must be remembered and applied. . . .

4.00 *Analysis*

The breakdown of a communication into its constituent elements or parts such that the relative hierarchy of ideas is made clear and/or the relations between the ideas expressed are made explicit. Such analyses are intended to clarify the communication, to indicate how the communication is organized, and the way in which it manages to convey its effects, as well as its basis and arrangement. . . .

5.00 *Synthesis*

The putting together of elements and parts so as to form a whole. This involves the process of working with pieces, parts, elements, etc., and arranging and combining them in such a way as to constitute a pattern or structure not clearly there before. . . .

6.00 *Evaluation*

Judgments about the value of material and methods for given purposes. Quantitative and qualitative judgments about the extent to which material and methods satisfy criteria. Use of a standard of appraisal. The criteria may be those determined by the student or those which are given to him [Bloom, 1956, pp. 201-207].

Some classification scheme such as that above is needed. Perhaps most educational objectives could fit into the cognitive, affective, psychomotor scheme. In the next two chapters the characteristics of pupils and of teachers are organized according to three large categories. In subsequent chapters in the middle section of this book the three main domains with minor departures from the specific classes are also used.

The teacher and curriculum worker can ascertain for himself whether a classification scheme such as this is appropriate to his own field. In reading, arithmetic, spelling, and grammar, for example, which objectives can properly and readily be classified as in the cognitive domain? the psychomotor? the affective? In science, primary grades through higher education, which objectives could properly be classified as knowledge and intellectual abilities and skills? Which of the desired objectives of physical education are properly classified in the psychomotor domain?

Most of your learnings from reading and related study of this book will be in the cognitive domain—knowledge and intellectual skills and abilities. You may also experience change in the affective domain—interests, motives, attitudes, and values. You are not likely to acquire increased psychomotor abilities unless your instructor has you work with various types of equipment or instructional materials other than books and verbal material. You may wish now to turn to the subject index, check every fifth entry, and decide what your present knowledge and (as appropriate) intellectual skills and abilities are in relation to each subject checked. After completing your study of the book or course, look at the same items again to decide the extent to which you have learned efficiently.

MORE IMMEDIATE TEACHING–LEARNING GOALS

General objectives as given previously are helpful to the teacher in deciding the broad focus of instruction. They are not sufficiently explicit, however, to provide adequate direction of more immediate day-to-day learning activities and to reveal how efficiently students learn during a week, semester, or year. Examine the objectives, drawn up by five teachers, which cover instruction on a given day for an eleventh-grade girl.

TYPEWRITING

1. Understands rules for syllabication of words, spelling and dividing words into syllables.
2. Improves in using the hyphen and the shift-lock key and in using carbon paper with letters.
3. Uses the proper forms and terms in addressing envelopes.
4. Wants to be neat in handling and using carbon paper.
5. Wants to use time and materials efficiently.

U.S. HISTORY

1. Understands cause-and-effect relationships applied to historical events.
2. Improves in obtaining information from maps.
3. Becomes more proficient in reading for specific information.
4. Uses information about history in analyzing our current problems, policies, and institutions.

5. Develops understanding and appreciation of Washington's role and his policies in this country's early history and its present problems.

ENGLISH (FOCUSED ON SPEECH IMPROVEMENT)

1. Understands the mechanics of producing classroom plays on the radio.
2. Understands the significance of background music and timing in class-produced radio plays.
3. Improves in interpreting ideas and feelings.
4. Elicits the desired audience response better.
5. Improves in using the body and voice to convey intended meanings.

HOME ECONOMICS

1. Understands such terms as dart, tuck, pleat, seam allowance, alteration marking, straight-of-goods marking, ease allowance, stay-stitching.
2. Improves in laying out a pattern, marking it, and cutting it out.
3. Increases skill in stitching, pressing, fitting, and altering; putting in [illegible]ers, waistbands, buttonholes, snaps, hooks and eyes.
4. Wants to use time efficiently in order to complete garment.
5. Appreciates value of careful marking, cutting, and assembling.

SPANISH

1. Increases understanding of written and spoken Spanish.
2. Increases ability to think directly in Spanish, rather than in English and then translating.
3. Speaks Spanish more fluently, with correct pronunciation and meaningful expression.
4. Writes Spanish correctly with greater facility, noting spelling, accent marks, and word endings.
5. Appreciates the value of using Spanish well, both written and spoken.

Even these objectives in behavioral terms do not assure efficient pupil learning. Though the teachers want the girl to achieve them, efficient learning starts only when the girl also wants to. Similarly, the instructor in educational psychology sets a goal of having each student learn the characteristic of an efficient teaching–learning situation, but it is only when each student sets the same personal goal that the teaching–learning situation is likely to be an excellent one. Realistic goal-setting is in itself something each individual must learn. For a teacher to so manage a classroom that each learner sets realistic goals is one of the most important tasks of teaching. Chapter 11 treats goal-setting in the classroom in considerable detail.

SUMMARY

Long-term and more immediate objectives of education are needed in order to decide what students should learn and, to a lesser extent, how they will learn it. Many local, state, and national groups formulate objectives of education. Eventually, however, each teacher and each student must also decide what is important to learn. Learning is most efficient when the student knows what is to be learned and tries to learn it well.

An attempt has been made by one group to develop a taxonomy of educational objectives, with the objectives at all school levels in all subject-matter fields being organized into three groupings: the cognitive domain, the psychomotor domain, and the affective domain. Though this classification system is somewhat arbitrary, as are most classifications, many abilities and characteristics of human beings and many outcomes of learning fit into it readily.

QUESTIONS AND ACTIVITIES

1. How are the objectives of education related to efficiency of pupil learning?
2. (a) State your main subject-matter interest and the level of schooling with which you are most concerned.
   (b) For this situation, write the main objectives to be achieved, giving not more than one paragraph to each objective.
3. Evaluate any statement of objectives mentioned in the chapter. Consult the reference for further clarification of the objectives as necessary.

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Chapter 3 Pupil Characteristics and Efficiency of Learning

Within each learner as he comes to school are characteristics that, in part, determine his readiness to learn and define the limits of his learning in a variety of cognitive and psychomotor tasks. Such characteristics were shown diagramatically in Table 1.1 of Chapter 1. In this chapter the range among children and youth in intelligence and school achievements, psychomotor abilities and related physical characteristics, and affective characteristics and their interrelationships are discussed. Age, sex, home, and social-class background are also examined. In Chapter 4, the same pattern of teacher characteristics in the cognitive, psychomotor, and affective domain are treated. Chapter 5 is given to the more immediate and observable interactions and behaviors of pupils and teachers in school settings.

COGNITIVE ABILITIES AND INTELLECTUAL CHARACTERISTICS

The measurement of intelligence from its early history has been fairly closely tied to school learning situations. Early attempts at measuring intelligence were to ascertain what learning performances might reasonably be expected of individuals. There are yet many disagreements about the nature and measurement of intelligence and the relative influence of heredity and environment. Yet IQ's, based on such tests as the Revised Stanford-Binet Scales and the Wechsler Intelligence Scale for Children, correlate higher with school achievements in the academic areas than do scores from any other single test. These intelligence tests, though yielding a single score, measure a variety of cognitive and psychomotor abilities.

The range in IQ's found by Terman and Merrill (1937) in their standardization of the Revised Stanford-Binet Scales is shown in Figure 3.1. Figure 3.1 shows that the range is below 35 to above 175. (Chapters 15-17 treat evaluation and statistical procedures in detail. You may wish to consult these chapters in connection with terminology in the present chapter.) The large percent of the standardization group show IQ's between 85 and 114 with approximately 64 percent of the total group in this IQ range, between 16 and 17 percent below 85, and between 16 and 17 percent above 114.

What does this wide range of differences in IQ mean? It is known that individuals with IQ's below 35 are generally completely uneducable. Many of the lowest IQ never learn to dress themselves, to feed themselves, or to be toilet-trained. Performances of many high IQ individuals are represented in creativity as shown by Einstein, Oppenheimer, Schweitzer, and many others. John Stuart Mill, for example, started the study of Greek at age three and by age eight had read Xenophon, Herodotus, and Plato and had begun to study geometry and algebra.

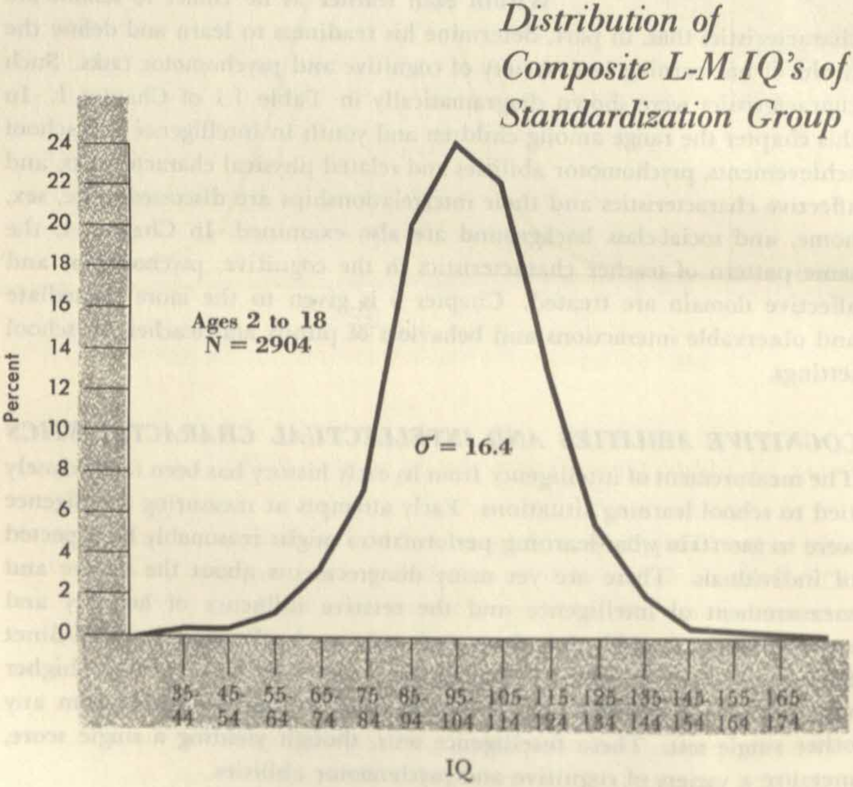
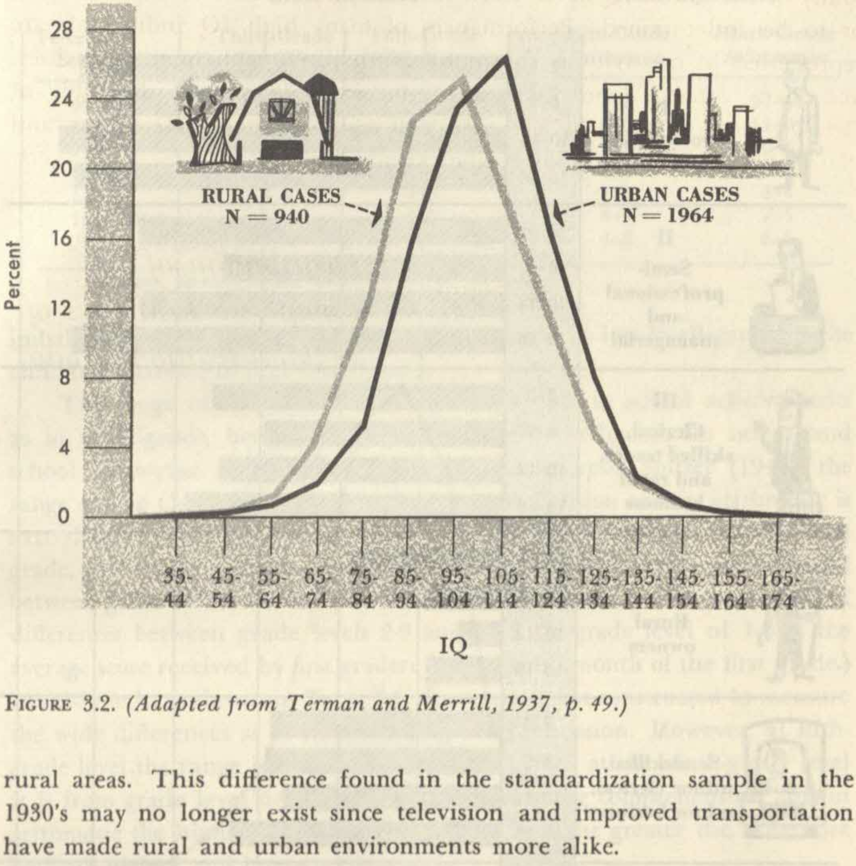


FIGURE 3.1. *(Adapted from Terman and Merrill, 1937, p. 37.)*

Although Terman found higher IQ's for urban than rural groups, as shown in Figure 3.2, there was no observable difference in the range of IQ's within each group. Mentally incompetent and highly gifted individuals are found in both rural and urban areas. The lower IQ's in the rural group may result because the items of the test are somewhat less favorable to the rural group and also because a large number of more able persons may have



Distributions of IQ's of Rural and Urban Groups

FIGURE 3.2. *(Adapted from Terman and Merrill, 1937, p. 49.)*

rural areas. This difference found in the standardization sample in the 1930's may no longer exist since television and improved transportation have made rural and urban environments more alike.

Figure 3.3 shows the mean IQ's of Terman's standardization sample according to the father's occupation and also according to various age groups. For the four age groups it is seen that the mean or average IQ is highest for professional occupations and second highest for the semiprofessional and managerial occupations. For groups above age six, the IQ is lowest for the rural owners. The difference in mean score according to occupations should not be interpreted as showing a real difference among groups either according to heredity or according to environment. To the best of our knowledge, children of very low to very high intelligence are born to fathers in all occupations. Of course, if two parents of low intelligence have children, we assume that their children's intelligence is also low. Similarly, if two parents of high intelligence have children, the chances of their children's also being of high intelligence are quite good. Even though this is the case, injury before or after birth to the central nervous system may lead to very low intelligence in children of parents of high intelligence; glandular

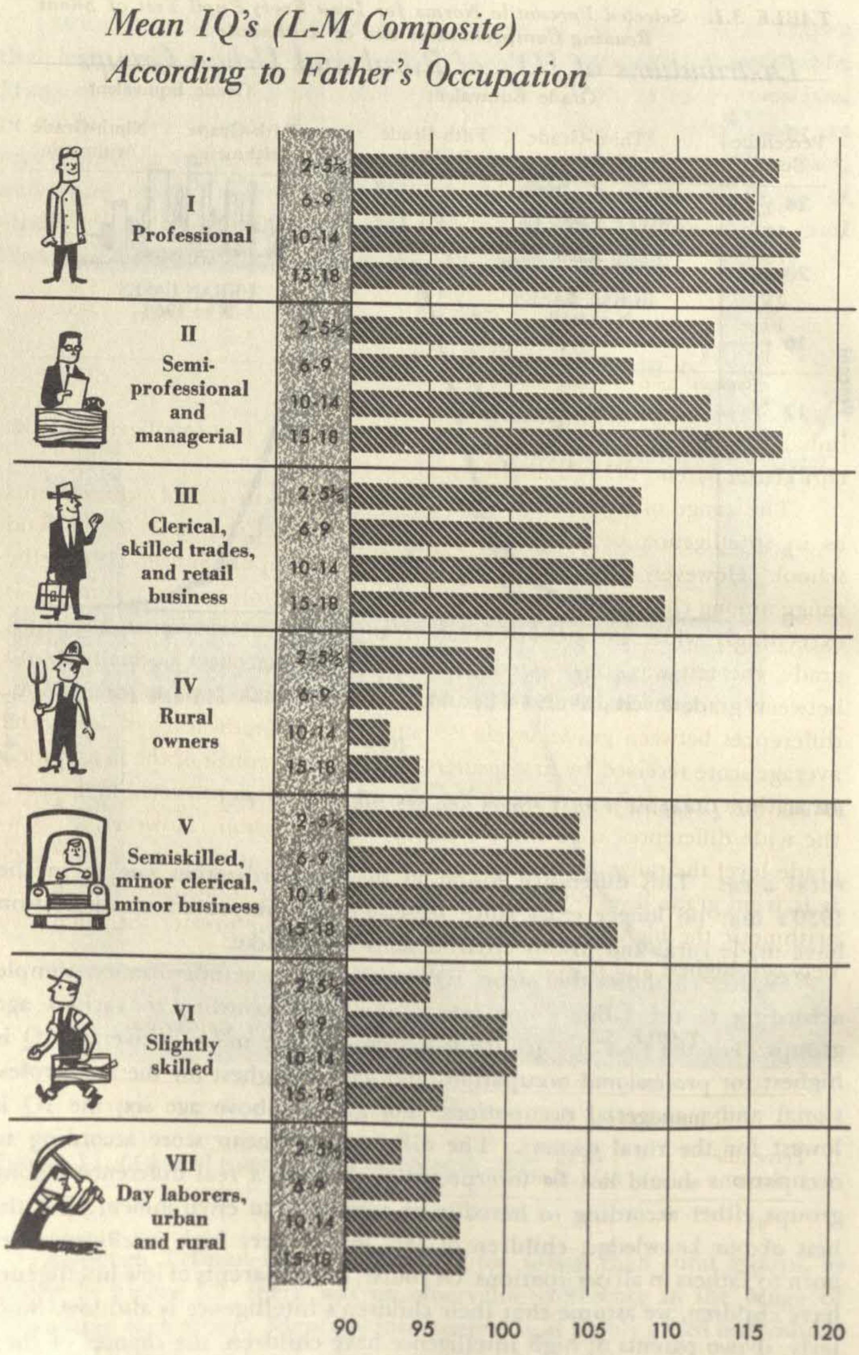


FIGURE 3.3. *(Adapted from Terman and Merrill, 1937, p. 48.)*

TABLE 3.1. Selected Percentile Norms for Iowa Every-Pupil Test of Silent Reading Comprehension and of Arithmetic

	Grade Equivalent		Grade Equivalent	
Percentile Score	Third-Grade Reading	Fifth-Grade Reading	Fifth-Grade Arithmetic	Ninth-Grade Arithmetic
99	8–2	9–8	7–2	11–6
90	6–0	8–4	6–5	11–0
75	4–9	7–2	6–2	10–6
50	3–9	5–9	5–9	9–9
25	3–3	4–8	5–3	8–4
10	2–6	4–0	4–9	7–5
1	1–9	2–9	4–2	6–5

SOURCE: *Spitzer, et al., 1947.*

imbalances of one sort or another may also result in low intelligence in the child from parents of high intelligence.

The range of differences is not quite so wide in school achievements as in intelligence, because children of lowest intelligence do not attend school. However, as shown in Table 3.1 based upon Spitzer (1947), the range among children in silent reading comprehension and in arithmetic is exceedingly wide. To measure silent reading comprehension in the third grade, the test was constructed to take care of differences normally found between grade levels 1-9 and 8-2, and at the fifth-grade level to take care of differences between grade levels 2-9 and 9-8. (A grade level of 1-9 is the average score received by first graders in the ninth month of the first grade.) In arithmetic, as shown in Table 3.1, the test was not constructed to measure the wide differences as in silent reading comprehension. However, at fifth-grade level the range is from grade level 4-2 to 7-2; at the ninth-grade level it is from grade level 6-5 to 11-6. In silent reading comprehension and in arithmetic the higher the grade level of the test, the greater the difference between highest and lowest achievers.

TABLE 3.2. Selected Percentile Norms for California Achievement Test of Language

Ninth Grade		Twelfth Grade	
Percentile Score	Grade Equivalent	Percentile Score	Grade Equivalent
99	13.0+	99	16.0+
90	11.1–11.7	90	14.2–14.8
70	10.0–10.3	70	12.9–13.4
50	9.1– 9.4	50	12.0–12.4
30	8.2– 8.7	30	10.8–11.4
10	6.9– 7.5	10	9.1– 9.9
1	5.6–	1	7.6–

SOURCE: *California Test Bureau, 1957, pp. 59–60.*

Table 3.2 gives the spread of achievement provided for by the California Achievement Test in Language for beginning ninth- and twelfth-graders (California Test Bureau, 1957). The test is intended to measure language performances of students who, as ninth-graders, achieve below a grade level of 5.6 to above a level of 13.0, or college freshmen; and for twelfth-graders from below grade level 7.6 to above grade 16.0, or college seniors.

A further indication of the range of achievements is shown in Table 3.3, Feldhusen and Klausmeier (1959). The purpose of the study was to determine achievement levels in arithmetic that would constitute appropriate new learning tasks for children of low, average, and high intelligence. The pupils of low intelligence were enrolled in special classes for educable mentally retarded children with IQ's ranging from 56 to 81. The children of average and high IQ were enrolled in regular fourth-grade classes with the range of IQ's for the average children being from 90 to 110, and for the high IQ children from 120 to 146. IQ was based on the Wechsler Intelligence Scale for Children (WISC), which secures somewhat lower IQ's in the upper range than do most intelligence tests. We found the level at

TABLE 3.3. Distribution of Appropriate New Learning Task Levels, Based on a Survey Test, on a Counting Task for 120 Boys and Girls at a Mean Age of 113 Months

	Intelligence Quotient of 56–81		Intelligence Quotient of 90–110		Intelligence Quotient of 120–146	
Task Level	Boys	Girls	Boys	Girls	Boys	Girls
Counting by:						
1's	2	1	—	—	—	—
2's	14	15	—	—	—	—
3's	4	4	1	4	—	1
4's	—	—	—	2	2	—
6's	—	—	5	4	2	—
7's	—	—	6	3	—	4
8's	—	—	—	2	2	1
9's	—	—	2	—	1	3
11's	—	—	—	—	—	—
12's	—	—	3	4	4	2
13's	—	—	2	1	5	5
14's	—	—	—	—	1	—
15's	—	—	—	—	—	—
16's	—	—	1	—	—	1
17's	—	—	—	—	2	2
18's	—	—	—	—	—	—
19's	—	—	—	—	—	1
23's	—	—	—	—	1	—
Mean counting level	2.1	2.2	8.6	7.1	14.5	11.7

Source: *Feldhusen and Klausmeier, 1959, p. 391. Copyright, 1959, by University of Chicago Press.*

which each child could count without error and then found the level at which he could not count. Table 3.3 shows that three low IQ children could not count by 1's and that one high IQ child could count by all numbers through 22 and had as a new learning task, counting by 23's. During the same school year, a number of low IQ children could not add two pennies and four pennies placed before them, whereas high IQ children added mixed numbers with unlike denominators.

In all achievements in the cognitive domain and at all school levels, kindergarten through high school, exceedingly wide ranges in achievement are found. Further, in those colleges and universities that admit all high school graduates, the range of achievements among students in all subject fields is exceedingly wide.

PSYCHOMOTOR ABILITIES AND PHYSICAL CHARACTERISTICS

As shown in Chapter 1, six factors in the psychomotor area are strength, impulsion, speed, precision, coordination, and flexibility. These factors, combined with such contents as manipulation of objects (including the body) and movements in speech production, are classed as psychomotor abilities. Object manipulation is requisite in the many perceptual motor skills taught in the schools such as drawing, handwriting, typewriting, shorthand, the making of maps in social studies, the making of objects in home economics, agriculture, industrial arts, and other classes. Manipulation of the body is essential to excellent performance in such activities as swimming and running and in the many activities combining object and body manipulation in such games as football and tennis. Speech production in general school activities, as well as in more specialized areas such as singing and dramatics, also requires the use and development of motor abilities. We now examine only two of many studies which report the wide range of performances found in a variety of motor skills and physical characteristics.

Table 3.4 shows the range, mean, and standard deviation in six physical measures for 40 boys and 40 girls with IQ's ranging from 62 to 146. The chronological age range, not reported, is from 119 to 132 months with the mean approximately 125. In most of the physical measures the boys show a slightly higher range than do the girls. The difference in height between the shortest and the tallest boy is approximately 13 inches, the difference in weight is 64 pounds, and in strength of grip it is 15.5 kilograms. The number of permanent teeth ranges from 11 to 28, carpal age from 89 to 153 months, and handwriting speed from 5.4 to 98 letters per minute. Note that in grip, a measure of strength, the strongest boy is three times stronger than the weakest girl; in handwriting speed, which also requires cognitive processes of perception and remembering, the ratio between the best and poorest performance is about 18 to 1.

In connection with physical fitness and physical education programs,

TABLE 3.4. ***Means, Standard Deviations, and Ranges for Six Measures of 40 Boys and 40 Girls, Normally Distributed According to WISC IQ, at 125 Months of Age***

Measure	Boys Mean	Boys S.D.	Boys Range	Girls Mean	Girls S.D.	Girls Range
Height in inches	55.10	2.80	47.9– 60.8	55.24	2.41	50.8– 60.0
Weight in pounds	77.22	16.23	49.3–113.3	75.36	13.78	55.0–111.5
Grip in kilograms	20.90	3.47	13.0– 28.5	17.70	3.28	9.4– 23.7
Permanent teeth	15.05	4.37	11.0– 28.0	16.45	4.53	11.0– 27.0
Carpal age in months	120.65	13.77	89.0–153.0	124.80	9.52	101.0–156.0
Handwriting speed in letters per minute	43.60	21.90	5.4– 98.0	47.20	20.70	9.2– 82.0

SOURCE: *Klausmeier, Feldhusen, and Check, 1959, p. 86.*

many researchers are gathering information concerning a variety of physical performances of children and youth. Representative of this effort is a comprehensive study under the auspices of the American Association for Health, Physical Education, and Recreation of the National Education Association. As part of a physical fitness project, a nationwide survey was made of 8500 boys and girls in Grades 5 through 12. Subsequently the results were reported for the following performances: pull-up, modified pull-up, sit-up, shuttle run, standing broad jump, 50-yard dash, softball throw for distance, and 600-yard run-walk (Hunsicker, 1958). Table 3.5 gives selected percentile norms in the 50-yard dash for boys and girls at age ten, thirteen, and sixteen. In the report (1958), other percentile scores are given also for each age, ten through seventeen.

TABLE 3.5. ***Selected Percentile Norms in the 50-Yard Dash in Seconds for Boys and Girls at Selected Ages***

Percentile[a]	Age 10 Boys	Age 10 Girls	Age 13 Boys	Age 13 Girls	Age 16 Boys	Age 16 Girls
100th	6.5	6.9	5.8	6.0	5.4	6.0
95th	7.6	8.0	6.5	7.4	6.1	7.1
75th	8.3	8.6	7.3	8.0	6.5	7.9
50th	8.8	9.1	7.8	8.5	7.0	8.4
25th	9.4	9.8	8.3	9.0	7.3	9.0
5th	10.8	10.8	9.3	10.5	8.0	10.9
0th	13.5	15.1	12.5	13.0	9.7	12.3

[a] The general procedure is to report percentile scores from 1–99; in Chapter 17 a procedure for computing percentiles 1–99 is given.

SOURCE: *Hunsicker, 1958, pp. 19, 26.*

The range in running the 50-yard dash at age ten is from 6.5 seconds for boys to 15.1 seconds for girls, at age thirteen from 5.8 to 13.0 seconds, and at age sixteen from 5.4 to 12.3 seconds. At every age, the fastest time is for boys and the slowest for girls. Half of the boys and girls, by definition, are between the 25th and 75th percentile score. At age ten, this middle half of the boys run the dash in from 8.3 to 9.4 seconds. It is interesting to note, also, that the top half of the boys at age ten run the dash in 8.8 seconds or less, whereas at age sixteen, 25 percent of the girls yet require 9.0 or more seconds. At all age levels and for both boys and girls with the exception of sixteen-year-old boys, the fastest child runs the 50-yard dash in less than half the time of the slowest.

The differences in strength, handwriting speed, running and the other physical measures are representative of differences found by other researchers. The main implication for education is that we should not fight against or even try to reduce differences. Rather, we should try to understand what the child can now do and attempt to take him at his pace to higher levels of performance. In this way only can we have efficient learning by all individuals.

AFFECTIVE CHARACTERISTICS

Interests

The interests of children and youth in sports and games, television programs, radio programs, reading, school subjects, and school activities have been widely investigated. Interests in vocations have been studied at the high school level, but much more so at the young adult and later level. From all the investigations it appears that interests are highly situational. Regardless of the individual's situation, he tends to find something which captures and holds his attention and interest. Thus, prior to the days of radio, television, jet airplanes, and atomic energy, children and youth showed interest in their environment.

Whereas intelligence, school achievements, and psychomotor abilities have been measured by many researchers, much less work has been done with interests. Yet interests are equally or nearly as important in the daily affairs of children and youth as are intellectual and psychomotor abilities. In various areas of subject matter at all school levels and in almost every classroom, it is possible to find pupil interests ranging from very low to very high.

Jersild and Tasch (1949) investigated the interests of 2248 children in Grades 1 to 12 in the Middle West, South, and around New York City. Table 3.6 gives the responses of the pupils in percent to various categories of things liked best in school. For both boys and girls, sports, gym, and physical education were liked more at successive school levels, primary through senior high school. From this it is inferred that there is higher interest in sports and gym at successive school levels. Arithmetic and mathematics dropped off for girls especially from junior to senior high school. English usage, reading, and other language arts showed a sharp drop for boys after the primary grade level. Boys showed a sharp increase in liking of science from junior to senior high school, whereas for girls, the interest remained the same. Interest in local and world affairs remained, after the first three grades, fairly stable. It is interesting to note that art, music, and dramatics, which remained fairly stable throughout the grades, were liked more than local and world affairs by both boys and girls at all school levels. The total percents toward the bottom of Table 3.6 vary from 79 to 114. This variation under 100 percent comes because some items are not listed in the table and above 100 percent because some students reported more than one thing as best liked within certain categories.

TABLE 3.6. Things Liked Best in School by Pupils of Various Grade Levels in Percent of Responses

Grades (Boys)					Grades (Girls)			
1–3	4–6	7–9	10–12		1–3	4–6	7–9	10–12
11	13	31	35	Sports, gym, physical education	8	9	33	34
28	24	24	14	Arithmetic, mathematics	21	26	19	8
32	19	10	11	English usage, reading, etc.	36	28	20	28
0	3	7	21	Nature study, science	1	4	9	9
1	9	7	8	Local and world affairs, social studies	1	11	10	6
13	11	10	16	Art, music, dramatics, etc.	17	15	16	14
0	0	0	5	Self-improvement, vocations	0	0	0	15
85	79	99	110	Total percent	84	93	107	114
363	309	282	159	Number of cases	331	343	290	171

SOURCE: *Adapted from Jersild and Tasch, 1949, pp. 138–139.*

The changes in school interests from primary grades to senior high school are summarized as follows:

> The typical first or second grader is interested in school and what the school represents. More likely than not he likes his teacher, too. The life of a scholar appeals to him. He is challenged by what there is to learn. He may say, as one child in this study said, that one of the happiest days in his life was the day he learned "to take away." When he tells what he likes about school he mentions things that distinctly belong to school much more frequently than he mentions things that school shares with life outside, such as games and outdoor play.
>
> The young child's friendly feeling about school appears not only when he talks about school as such but also when he happens to mention school in describing his likes and wishes. When describing what he dislikes most in life outside school, the young child is likely to make very few unfavorable references to any burdens or discomforts which the school had placed on his out-of-school life.
>
> As the average child moves up through the grades he seems to become less eager about things that distinctly belong to school and scholarliness, more inclined to complain, more interested in things that go along with school rather than with work in the classroom. He becomes relatively more interested in recess periods than in class periods. He mentions play and sports more often. There is a greater hiatus between his wishes and what the school offers. This is particularly marked, as we have seen, in connection with his wishes for self-improvement and for vocational competence, on the one hand, and what the school offers to further his aspiration [Jersild and Tasch, 1949, pp. 41–42].

Whether this pattern of interest would be found at the present time is difficult to ascertain. It appears, however, that since the Russian sputnik and the much higher emphasis on science and mathematics, boys and girls in high school are not only becoming more interested in science and mathematics but also in excellent academic performances in school generally. The role of the teacher in building interests in pupils and helping them to establish goals is treated in considerable detail in Chapter 11.

Attitudes and Values

Attitudes and values, like interests, are highly dependent upon environmental factors such as the home, the neighborhood, the school, the church, and many other agencies. Attitudes and values have been studied widely in young adults and older persons and less widely in children and youth. In part, this is because both attitudes and values become much more stable in later adolescence than prior to that age. The teaching of attitudes and values is considered sufficiently important that Chapter 9 is devoted to it entirely; however, two important research reports are now examined.

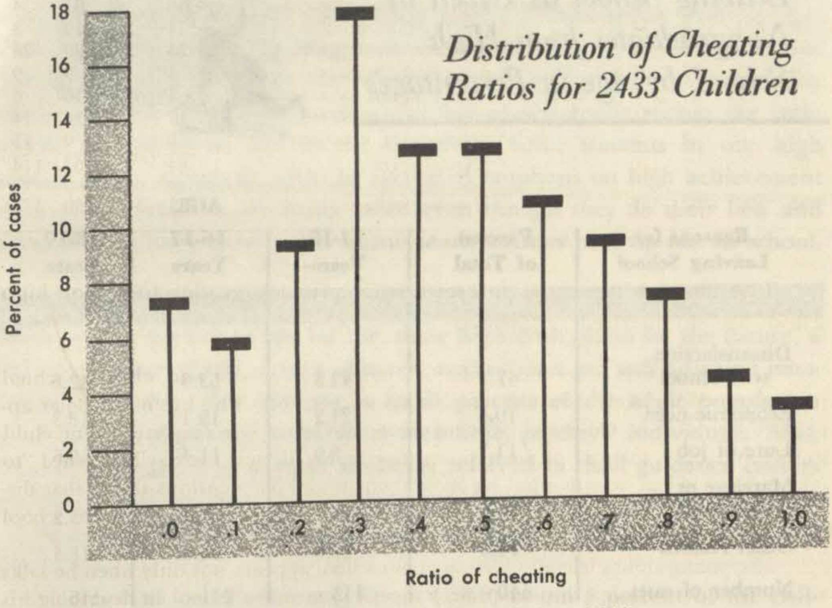


FIGURE 3.4. *(Adapted from Hartshorne and May, 1928, p. 386.)*

The Character Education Inquiry of Hartshorne and May (1928) was carried out in an excellent manner. In this inquiry tests were devised and administered in which pupils were confronted with temptation or with a conflict between their own pleasure and the good of others. Among the tests was one in which the pupil was asked to do as well as he could on an impossible task such as putting dots in small circles while blindfolded. The task is obviously so difficult that any pupil who succeeded in it certainly achieved it by somehow removing or looking around his blindfold. In another test, the child was given a box of coins and had the opportunity to take some of the coins before returning them to the front of the room. The investigators could check whether or not the child actually took any coins.

Principal Reasons for Leaving School as Given by Nongraduates from High School, by Age in Percentages

Reasons for Leaving School	Percent of Total	AGE 14-15 Years	16-17 Years	18-19 Years
Dissatisfaction with school	47.7	42.5	53.3	42.6
Economic need	19.4	21.2	19.1	18.3
Lure of job	11.7	8.0	11.4	15.6
Marriage or pregnancy	6.6	17.7	1.4	5.2
Other reasons	14.6	10.6	14.8	18.3
Number of cases	440	113	211	116

FIGURE 3.5. *(Adapted from Johnson and Legg, 1948, p. 17.)*

The distribution of ratio scores for cheating, i.e., the number of times in ten opportunities to cheat in a large number of situations is shown in Figure 3.4. About 7 percent of the pupils had near perfect ratio scores (did not cheat at all) and about 4 percent cheated at every opportunity. However, since the high percent of cases fall between the high and the low ends, the tendency is for individuals to be honest in some situations and not honest in other situations. This distribution is not greatly dissimilar from the distribution of IQ scores based on the Stanford-Binet, as previously shown in this chapter.

Besides indicating that character traits are distributed in the child population much as is IQ, Hartshorne and May also concluded: "The concomitants of deceit are, in order of their importance, (1) classroom association; (2) general personal handicaps, such as relatively low IQ, poor resistance to suggestion, and emotional instability; (3) cultural and social limitations in the home background; and (4) such other miscellaneous facts as far loosely associated with deception (Hartshorne and May, 1928, p. 412)."

Values and attitudes toward school can also be inferred from a study by Johnson and Legg (1948). The researchers interviewed 440 boys and girls, age fourteen to nineteen, who had quit school while yet in the grades or in high school. Figure 3.5 shows the principal reasons which these dropouts gave as the basis for leaving school. Dissatisfaction with school was given in 47.7 percent of the cases. Though not shown, dissatisfaction with school was found to be associated with failing grades, dissatisfaction with courses, disliking of teachers or teaching methods, disliking of the social relations in the school, and a few other miscellaneous reasons. It should be noted that the reasons for leaving high school do not always reside within the individual student alone but in the situation. Some students in our high schools today, especially with the increased emphasis on high achievement in academic subjects, are being failed even though they do their best and because of failures must either repeat many courses or drop out of school.

Personality Integration

Some persons are full of zest for life, show high enthusiasm for the future, a high acceptance of self, accept objective reality, and are well adjusted emotionally. At the other extreme, a small percent of the adult population is in public and private hospitals as incurable, psychotic individuals. Also, very young children at present are being referred to child guidance centers and to private psychiatrists for emotional disturbances, and the incidence of emotional disturbance is quite high for pupils of elementary and high school age.

Klausmeier, Feldhusen, and Check (1959) found 5 percent of the children of fifth-grade age quite disturbed and needing intensive therapy directly or in connection with a highly unfavorable home situation. Clancy and Smitter (1953) made a much more comprehensive study of emotionally disturbed children in the schools of Santa Barbara County. Figure 3.6 shows the incidence of emotionally disturbed children by grade and home conditions related to disturbance. A sharp rise is seen in the incidence from kindergarten to first grade. The percent of disturbed children is about the same from first through seventh grade, with a rise again at the eighth grade. The ungraded special classes show a much higher percent than do the regular classes through eighth grade. Emotionally disturbed, more frequently than normal children, come from broken homes, from homes where the mother is employed full time, from homes where there is serious neglect and

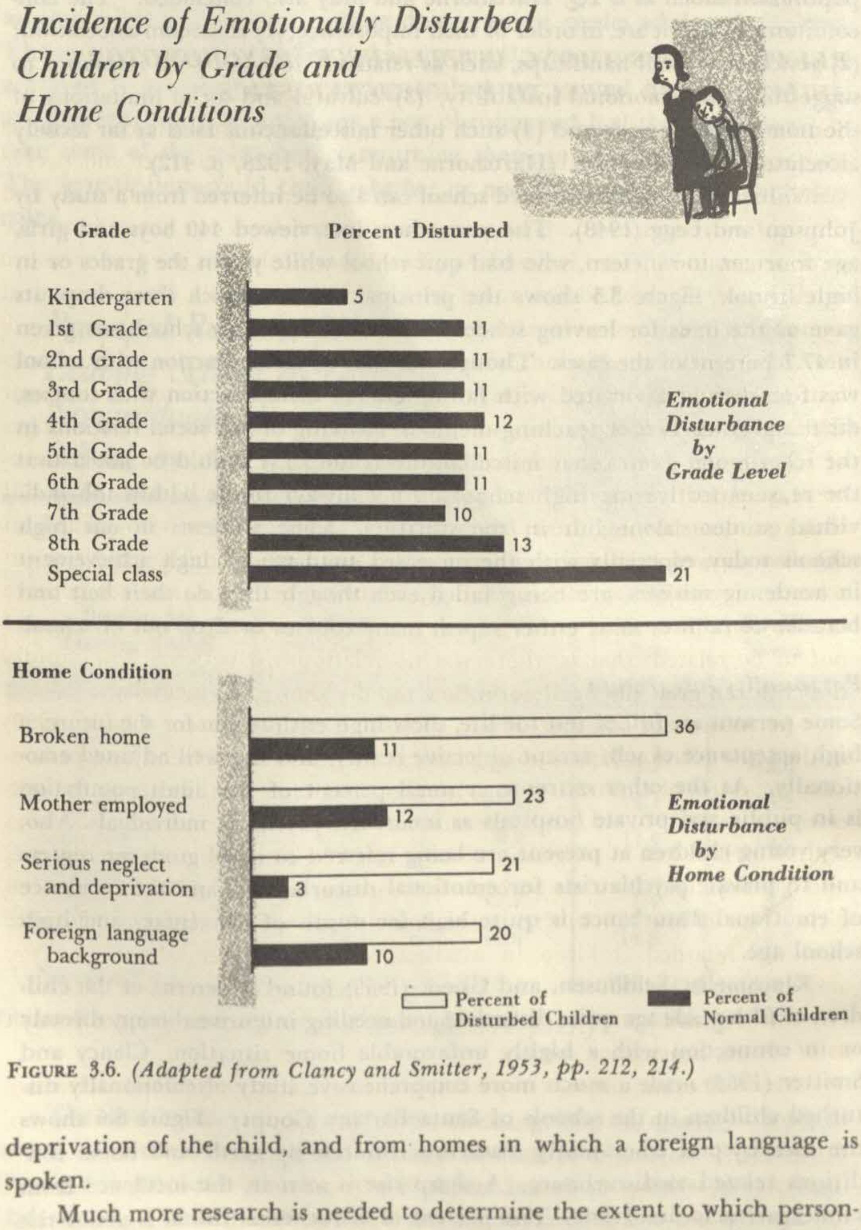


FIGURE 3.6. *(Adapted from Clancy and Smitter, 1953, pp. 212, 214.)*

deprivation of the child, and from homes in which a foreign language is spoken.

Much more research is needed to determine the extent to which personality disintegration may result from biological rather than environmental circumstances. Severe emotional disturbance is one of the most critical social problems of our time. It is possible that the incidence of severe emotional disturbance could be greatly lessened; and it is a known fact that at every school level, primary through higher education, some individuals do not learn efficiently because of severe emotional problems and related personality disorganization.

RELATIONSHIPS AMONG INTELLIGENCE, PSYCHOMOTOR ABILITIES, AND AFFECTIVE CHARACTERISTICS

Sontag and his associates (1958) at the Fels Research Institute conducted a longitudinal study with 140 children between the ages of three and twelve years. Stability of tested intelligence and the personality, familial, and physical correlates of the changes in intelligence from age three to twelve were ascertained. The Revised Stanford-Binet Scale was used to measure intelligence. Each child was rated on fourteen personality dimensions, and anatomical measures were also secured. Wide variations in IQ from one year to the next were found, with the highest degree of stability from ages four to six and again from ages six to ten. The median change throughout the study was 17.9 IQ points, and 52 percent of the children had changes of 15 or more. It was found that children showing a high need for achievement, competitive striving, and curiosity gained more in IQ score than did children not showing these characteristics. The children who gained in IQ also showed high independence rather than emotional dependence on parents, aggressiveness rather than withdrawing behavior, and competitive inclinations. Rate of physical growth and rate of mental growth were found not to be related; that is, there was no relationship between how rapidly the children grew physically and how rapidly they grew mentally.

At Wisconsin another group (Klausmeier, Feldhusen, Check, 1959) studied the relationships among physical, mental, achievement, and personality measures of children of low, average, and high intelligence at the successive ages of 101, 113, and 125 months. Our sample consisted of 20 boys and 20 girls of low intelligence, 20 boys and 20 girls of average intelligence, and 20 boys and 20 girls of high intelligence, a total of 60 boys and 60 girls. The 40 low IQ children were drawn from special classes of educable mentally retarded children in Madison and Milwaukee; the 40 average and 40 high IQ children were drawn from regular classrooms of Madison. No low IQ child was included who had a second severe handicap such as of vision, hearing, or speech.

Medical examination by pediatricians revealed no marked difference in general health according to the three IQ groups. Dental health, appraised by practicing dentists, was found to be related to IQ level with the incidence of satisfactory dental health 25 percent for the low IQ, 43 percent for the average, and 83 percent for the high IQ. The psychological health of the children, as appraised by school and clinical psychologists, was generally good, with no significant differences among the three IQ groups as shown by personality assessments. Of 120 children in 1957–1958, 90 needed no therapy or were apparently in good psychological health, 24 were in need of some therapy that was assumed could be handled by regular school personnel, and 6 (about 5 percent) were in need of intensive therapy. Twenty-nine fathers of the low IQ children had occupations in unskilled, semiskilled, and skilled categories, whereas the fathers of 34 of the high IQ children were found in the top two categories—professional and managerial and official—with little overlap between these two IQ groups. The fathers of the average IQ group clustered more toward the middle of the occupational categories, with overlapping from semiskilled through professional occupations.

The intercorrelations of eighteen measures for the sixty low, average, and high IQ boys and for sixty low, average, and high IQ girls at 113 months of age are shown in Table 3.7. The correlations among the measures largely in the cognitive domain—IQ, reading, arithmetic, language, and handwriting—are somewhat higher than usually found because our study included a relatively large proportion of low and high IQ children.

The main conclusions based on the intercorrelations in Table 3.7 are as follows:

1. Height, weight, grip, and carpal age are positively and significantly correlated for both sexes. Dentition correlates inconsistently and generally not significantly with the other four physical measures. Strength of grip correlates positively and generally significantly with IQ, reading achievement, arithmetic achievement, language achievement, and handwriting. The correlations between the physical measures and all other measures are generally nonsignificant; that is, the child's height, weight, carpal age, and number of permanent teeth are unrelated to IQ, achievements, and personality characteristics.

2. IQ, reading achievement, arithmetic achievement, language achievement, and handwriting correlate high, positively and significantly. The IQ and achievement measures do not correlate consistently with other measures except with strength of grip as noted previously, and with two personality ratings—achievement in relation to expectancy and integration of self-concept.

3. Chronological age shows no significant correlations with the other measures except with boys' dentition. In setting up the study the researchers intended to secure a sufficiently narrow range in chronological age to secure nonsignificant correlations with the other measures. The statistically significant correlations between chronological age and number of permanent teeth for boys is interpreted as possibly a unique characteristic of dental development of this sample of boys.

4. Two main patterns of significant and positive correlations emerged related to the personality ratings. Emotional adjustment, achievement in relation to expectancy, and integration of self-concept correlate positively and generally significantly for both sexes. Expression of emotion, behavior pattern, and the child's estimate of his own abilities also show positive and generally statistically significant correlations for both sexes. In addition, two of the personality ratings, achievement in relation to expectancy and integration of self-concept correlate positively and generally significantly with IQ, reading achievement, arithmetic achievement, language achievement, and handwriting, with the correlations higher for girls than for boys.

TABLE 3.7. ***Intercorrelations Among Sixteen Measures for Sixty Boys and Sixty Girls at 113 Months of Age***

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Height		60*	47*	18	49*	17	25	24	23	06	−14	−16	−20	08	07	−08
		65*	57*	05	68*	35*	29	35*	33*	−03	15	−03	28	03	−04	−01
2. Weight			41*	17	51*	14	15	11	09	04	−01	−12	−13	34*	39*	27
			45*	27	52*	11	03	08	06	07	12	−04	14	23	16	17
3. Grip				19	44*	39*	41*	40*	41*	18	−12	−05	−03	21	16	−05
				24	47*	50*	48*	52*	54*	01	39*	09	43*	10	−04	−05
4. Permanent teeth					24	−21	−12	−15	−11	44*	10	16	13	08	08	16
					35*	−05	00	−03	01	06	−10	−04	00	02	−07	−12
5. Carpal						01	07	02	04	05	−20	−24	−25	16	14	−04
						22	20	20	19	15	−03	−10	03	−12	−16	−15
6. WISC IQ							93*	94*	93*	−05	−24	01	02	03	02	−08
							94*	96*	95*	−13	36*	17	38*	09	05	−27
7. California Reading								95*	96*	−04	−15	11	08	−05	−06	01
								94*	95*	−09	30	18	28	08	03	−26
8. California Arithmetic									96*	−05	−18	07	04	−03	−05	−01
									97*	−08	34*	16	40*	07	03	−24
9. California Language										−03	−18	12	07	−02	−04	−04
										−11	35*	19	40*	08	04	−24
10. Chronological age											13	11	23	−01	−07	06
											−07	−11	−04	−13	01	−13
11. Emotional adjustment												52*	72*	06	−15	28
												50*	71*	21	11	13
12. Achievement in relation to expectancy													52*	−10	−08	28
													49*	17	15	25
13. Integration of self-concept														−08	−06	21
														26	19	11
14. Expression of emotion															77*	27
															81*	49*
15. Behavior pattern																33*
																40*
16. Child's estimate of abilities																

Decimal points have been dropped; the upper row on each variable is for boys, lower row is for girls. The asterisk * indicates an *r* significantly different from 0 at or beyond the .01 level; for significance at the .01 level, an *r* of .33 is required; at the .05 level, .25.

SOURCE: *Klausmeier, Feldhusen, and Check, 1959, p. 92.*

> 5. Handwriting, as noted correlates positively, generally high, and significantly with IQ, reading achievement, arithmetic achievement, language achievement, strength of grip, achievement in relation to expectancy, and integration of self-concept. It is interesting to note that the correlations between handwriting and height, weight, permanent teeth, and carpal age are not significantly different from zero. Thus, the patterns of correlations suggest that not only are the physical measures other than grip not positively correlated with IQ, reading, arithmetic, and language achievement, they are also not correlated with handwriting speed.
>
> 6. Sociometric scores correlate positively and significantly only with integration of self-concept. This conclusion is applicable only to the average and high IQ children because the low IQ children were not included in computing the correlations. The method of scoring the sociometric test with weighted scores permitted the low IQ children in small classrooms to receive as high scores as the average and high IQ children in regular classrooms [Klausmeier, Feldhusen, Check, 1959, p. 94].

We also examined differences among mean scores of the three IQ groups and found no statistically significant differences in six measures: weight, number of permanent teeth, carpal age, emotional adjustment, emotional expression, and behavior pattern. In other words, the low IQ children weighed about the same as did the average and the high. The same holds for the other five measures just listed. The low IQ children were, however, significantly lower than the average and the average were significantly lower than the high IQ in five measures—strength of grip, reading achievement, arithmetic achievement, language achievement, and achievement in relation to expectancy. In integration of self-concept the low IQ children were lower than the average and the high IQ children. The latter two were the same. In the child's estimate of his own abilities the average IQ children were lower than the high and the low IQ children who were the same. Only the average and high IQ children were compared in sociometric scores, as the low IQ children were enrolled in special classes. For the average and high IQ children enrolled in the same classes there was no significant difference in sociometric scores. In handwriting the low IQ children were much lower than the average and high who were about the same.

The conclusions of Sontag and his associates and of the Wisconsin study differ sharply with the concept of organismic age proposed by Olson and Hughes (1943), Olson (1949) and Millard (1951). These men consistently suggest that the teacher should examine the child's rate of growth in height, weight, number of permanent teeth, strength of grip, and carpal age in order to understand better his rate of growth in such areas as reading, arithmetic, and language. Further judgments that such physical measures as height, weight, number of permanent teeth, and carpal age should be given little or no attention in predicting the achievements of elementary school children in reading, arithmetic and language are provided by Tyler (1953); Blommers, Knief, and Stroud (1955); Enos (1958); Gleason and Klausmeier (1958); and Klausmeier, Beeman, and Lehmann (1958). These last-named in no way deny, however, the idea that a child's size and his ability to perform various motor tasks may affect his feelings toward himself and others. Further, it is not intended to de-emphasize the importance of psychomotor abilities.

At pubescence marked changes often occur in attitudes and values, suggesting a relationship between levels of maturation and affective characteristics in pupils of junior high school age. The age at which boys and girls reach puberty varies widely. Some normally developing girls, for example, reach menarche as early as age nine, whereas others do not until age fifteen. Some early maturing boys are in pubescence at age eleven; others, not until age sixteen or seventeen. Among 1000 girls of the same age, the postmenarcheal demonstrated considerably greater heterosexual interests, more interest in clothing and adornment, less interest in games or activities requiring rigorous or strenuous activity, and more daydreaming than did the premenarcheal (Stone and Barker, 1939). Socially rejected boys and socially rejected girls of junior high school age have several traits in common: not being good looking, being untidy, restless, talkative, and not likeable (Gronlund and Anderson, 1957).

A longitudinal study, started at the University of California in the early 1930's with infants, provides much additional information about the relationships among various facets of development during adolescence. Jones and Bayley (1950) reported on the characteristics of sixteen early and sixteen late-maturing boys, with level of maturity based on skeletal age. When the boys were thirteen, fourteen, and fifteen years old, the early maturers showed higher interest in matters of personal grooming such as cleanliness, neatness of clothing, taking care of hair, nails, and the like; were more relaxed and friendly, more animated and eager; and had better relationships with age-mates.

In a later study Jones (1958) reported on the high school students who were mentioned frequently and infrequently in the school newspaper. The frequently mentioned again had higher carpal maturity than did the infrequently mentioned. The frequently mentioned group while in high school was rated as more buoyant, poised, having higher prestige, and providing more leaders than the other group. These same high-and-low-mention students were followed up fifteen years after graduation. The high-mention group furnished more individuals who had achieved status in jobs or in the community, but in the no-mention group at least a third of the girls and a fourth of the boys had attained a degree of recognition comparable with any in the group who were much more conspicuous in high school. In general, the patterns of social participation whether through leadership, entertainment, or service tended to persist into college and adult life. However, social participation varied with the opportunities available and the values placed upon such roles in the individual adult's immediate environment. In general, opportunities to lead and influence of the kind available in high school were relatively lacking to many individuals as young adults; or, put another way, such opportunities are luxuries which they cannot afford. For the most part, neither their working nor their leisure hours are organized so that they have anything comparable with the number of interpersonal contacts which were customary in high school.

As shown in the preceding discussion, the relationship between physical maturation and personality traits is somewhat different during the elementary and junior high school years. Such is not the case between IQ and school achievements. Correlations between intelligence and achievements in mathematics, science, social studies, and English at the junior and senior high school level typically run from about .60 to about .85, whereas the correlations between IQ and school marks are considerably lower, usually from about .40 to about .60. Correlations of similar size were reported previously in Table 3.7 between IQ and achievements in the fifth grade. Correlations of .60 to .85 are not sufficiently high that one can predict reliably the performance of individuals in various subject fields such as mathematics or science. They are sufficiently high that, if, for example, only students with IQ's above 115 were selected for high school education, one would have a large number of the high achievers. However, a large number of high achievers in the IQ group 100 to 115 would have been excluded.

Further, some students are found to achieve high, for example, in mathematics and science but slightly above average or even below average in English or social studies. Anderson, Page, and Smith (1958) reported the IQ's and achievements of 1445 high school seniors in Kansas. They secured a stratified sample from high schools of varying size throughout the state and about an equal number of boys and girls. The top 10 percent of boys and of girls and the bottom 10 percent in intelligence, science, mathematics, social studies, and English achievement were identified; and their scores were compared with the total distributions of scores in each of the five tested areas. Of the many comparisons made, only that pertaining to the lowest 10 percent in science is given in Figure 3.7. Of the lowest 10 percent in science, 15.86 percent were also in the lowest 10 percent in mathematics, 75.87 percent were in the next lowest 40 percent, 7.58 and .69 percent scored above the mean or in the upper half in mathematics. It is also interesting that of the 145 seniors lowest in science, one was in the highest 10 percent in mathematics, English, and IQ. The researchers concluded that an acceptable criterion for exceptional performance in science and other academic areas must be sought outside the province of intelligence. This conclusion appears to be reasonable. If one wishes to find the high achievers in mathematics, the obvious thing to do is to give a mathematics achievement test and get teacher judgment to ascertain the high achievers in mathematics. Similarly, if one wishes to find the high achievers in science, one gives a science achievement test and also secures teacher judgments as to who the high science achievers are. It is when no achievement test results and no teacher judgments are available that one would do far better than pure chance to predict achievements based on IQ results. In the Anderson study, as shown in Figure 3.7, about 91 percent of the lowest science achievers were also below the mean in intelligence and only about 9 percent were above the mean.

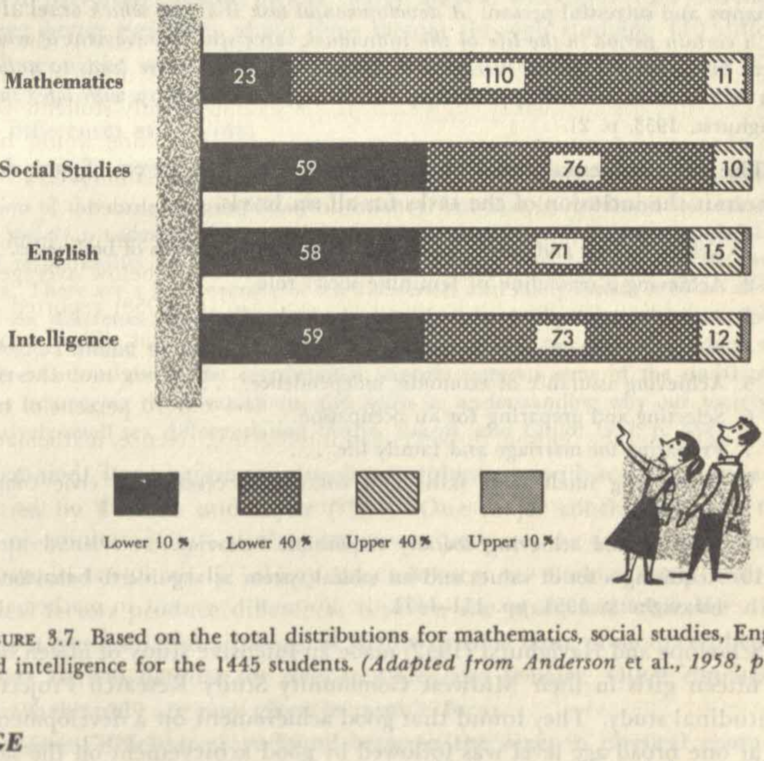

Numbers of Seniors Whose Science Scores Placed Them in the Lower 10 Percent of That Distribution Distributed as Shown on the Basis of Their Scores in Mathematics, Social Studies, English, and Intelligence

FIGURE 3.7. Based on the total distributions for mathematics, social studies, English, and intelligence for the 1445 students. *(Adapted from Anderson* et al., *1958, p. 54.)*

AGE

A vast amount of literature reports annually the psychological characteristics of children, youth, and adults at various chronological ages. Though much information has been gathered concerning the common characteristics of ten-year-olds, for example, there is equally abundant evidence about differences among them. As reported earlier in this chapter, Klausmeier, Feldhusen, and Check (1959) found the heaviest child at 125 months of age to weigh more than twice as much as the lightest child. Similarly, large differences are found in any human characteristic which we might investigate at any chronological age. So strong is the evidence about differences among children of the same chronological age that many persons favor the abandonment of chronological age as a basis for placing children in grades, kindergarten through Grade 12.

One significant attempt to relate the developmental characteristics of broad age groups to learning is incorporated in the concept of developmental tasks (Havighurst, 1953). Havighurst organized developmental tasks for six periods in human development: infancy and early childhood, middle childhood, adolescence, early adulthood, middle age, and later maturity. His definition of a developmental task follows:

> The tasks the individual must learn—*the developmental tasks of life*—are those things that constitute healthy and satisfactory growth in our society. They are the things a person must learn if he is to be judged and to judge himself to be a reasonably happy and successful person. *A developmental task is a task which arises at or about a certain period in the life of the individual, successful achievement of which leads to his happiness and to success with later tasks, while failure leads to unhappiness in the individual, disapproval by the society, and difficulty with later tasks* [Havighurst, 1953, p. 2].

The developmental tasks of adolescence are now given. Space does not permit the inclusion of the tasks for all six levels.

> 1. Achieving new and more mature relations with age-mates of both sexes. . . .
> 2. Achieving a masculine or feminine social role. . . .
> 3. Accepting one's physique and using the body effectively. . . .
> 4. Achieving emotional independence of parents and other adults. . . .
> 5. Achieving assurance of economic independence. . . .
> 6. Selecting and preparing for an occupation. . . .
> 7. Preparing for marriage and family life. . . .
> 8. Developing intellectual skills and concepts necessary for civic competence. . . .
> 9. Desiring and achieving socially responsible behavior. . . .
> 10. Acquiring a set of values and an ethical system as a guide to behavior. . . [Havighurst, 1953, pp. 111–147].

Schoeppe and Havighurst (1952) made an intensive study of fifteen boys and fifteen girls in their Midwest Community Study Research Project, a longitudinal study. They found that good achievement on a developmental task at one broad age level was followed by good achievement on the same task at subsequent age levels; that good achievement on one developmental task was generally associated with good achievement on other tasks at the same age level; and that in a minority of cases good achievement on one developmental task might be used by the individual to compensate for poor achievement on other tasks. Subsequently, Schoeppe, Haggard, and Havighurst (1953) reported that, if the adolescent is to accomplish successfully the developmental tasks required in his society, he must master his impulsivity and accept himself so that he can mobilize his energy to deal effectively with the social and cultural forces which impinge upon him.

One conclusion from these studies is that learning efficiency in the usual school subject-matter areas is related to emotional behavior and social adjustment. The emotionally disturbed or antisocial individual usually does not acquire knowledge and related cognitive skills as efficiently as does the one who is not disturbed or antisocial. A second conclusion is that within broad age limits, boys and girls must and usually can acquire some learnings efficiently. If they do not achieve most of the tasks required of adolescence, they are likely to experience difficulties in young adulthood.

SEX

Differences between the sexes are known to result in part from biological and in part from cultural factors. Barry, Bacon, and Child (1957) attempted to get better estimates about these factors through studying 110 different cultures of the world. The main culture samples were drawn from North America, Africa, and Oceania. The researchers concluded about the total sex differences as follows:

> A survey of certain aspects of socialization in 110 cultures shows that differentiation of the sexes is unimportant in infancy, but that in childhood there is, as in our society, a widespread pattern of greater pressure toward nurturance, obedience, and responsibility in girls, and toward self-reliance and achievement striving in boys. There are a few reversals of sex difference, and many instances of no detectable sex difference; these facts tend to confirm the cultural rather than directly biological nature of the differences. Cultures vary in the degree to which these differentiations are made; correlational analysis suggests some of the social conditions influencing these variations, and helps in understanding why our society has relatively small sex differentiation [Barry, Bacon, and Child, 1957, p. 332].

One of the best summaries of sex differences within our country was written by Terman and Tyler (1954). One major conclusion from their comprehensive study was that differences between the sexes become more pronounced from early infancy into adolescence. Both cultural and biological factors produce differences between the sexes, and whatever differences might result from biological factors become more pronounced because society ascribes definite sex roles to males and females. Other conclusions from their study are now given in capsule form.

Several differences are found between the sexes in physical characteristics. Boys are taller and heavier than girls except at ages eleven to fifteen when there is little difference because of the more rapid rate of maturation in girls. Girls precede boys by 12 to 20 months in reaching puberty. Boys have higher vital capacity than girls and are stronger than girls. There appears, however, to be a somewhat higher incidence of various defects of all sorts in males than in females.

Differences in intelligence are not usually found between boys and girls because the widely used individual intelligence tests—the Revised Stanford-Binet Scale and the Wechsler Intelligence Scale for Children—have been constructed to eliminate sex differences. However, girls typically score higher on verbal items, boys on quantitative and spatial items in both IQ and achievement tests. Girls receive higher grades in school than boys; however, after about the fifth grade boys score as high or higher than girls on achievement tests, particularly in science and mathematics.

In preference for play, games, and other activities, differences become apparent in early childhood and increase with successive age levels into adolescence. Girls, for example, prefer and actually do more reading on their own at all school levels than do boys. At all school levels boys engage in more active games. Large differences appear in vocational interests at the senior high school age. In this respect, certain occupations such as teaching in the primary grades and nursing will probably continue to be heavily preferred by females; whereas other occupations, especially those involving hard manual labor, will continue to attract males. Whether or not the great differences in the number of males and females in science, mathematics, engineering, and medicine will continue is not known. Apparently the Russians are educating many females for professional fields and occupations which are yet dominated by males in the United States.

Males show a higher degree of aggressive and dominant behavior than females, with more boys than girls apprehended as delinquents, and a much higher incidence of adult male criminals. Because of both biological and cultural forces, females apparently are more cooperative than males. In school girls tend to comply with the teacher's wishes more frequently than do boys. However, daydreaming is more common in adolescent girls than in adolescent boys, and in adulthood females show higher incidence of neuroticism than do males. The differences between the sexes in personality structure, emotional expression, sociability, character integration, and the like are much less clear than are the differences in physical characteristics, school achievements, and vocational interests.

The above differences, drawn from Terman and Tyler, are based on investigations of groups of males and females; these authors, however, repeatedly and carefully point out the large overlapping between the sexes in all measures. The extent of average differences and also the overlapping in six measures is shown for boys and girls at a mean age of 125 months in Figure 3.8. The range in IQ of the boys is from 62 to 146 and of the girls, from 63 to 135, with the mean IQ for boys 100.6 and for girls, 100.8. These boys and girls are much alike in intelligence; we selected them to be of the same IQ and chronological age in our study. In strength of grip, however, the boys' mean score is 20.9 and the girls' is 17.7. Though this average difference is quite large, there is a great deal of overlap in strength of grip between boys and girls. The girls have, on the average, 16.5 permanent teeth and the boys 15.5, as one would expect, since girls mature more rapid physically as a group; however, there is also a large amount of overlap, and the only child having a full set of twenty-eight permanent teeth is a boy. We did not find the higher school achievement generally found and predicted

Range and Mean Score for Sixty Boys and Sixty Girls at a Mean Age of 125 Months in Strength of Grip, Number of Permanent Teeth, Arithmetic Achievement, Language Achievement, Handwriting Speed and IQ

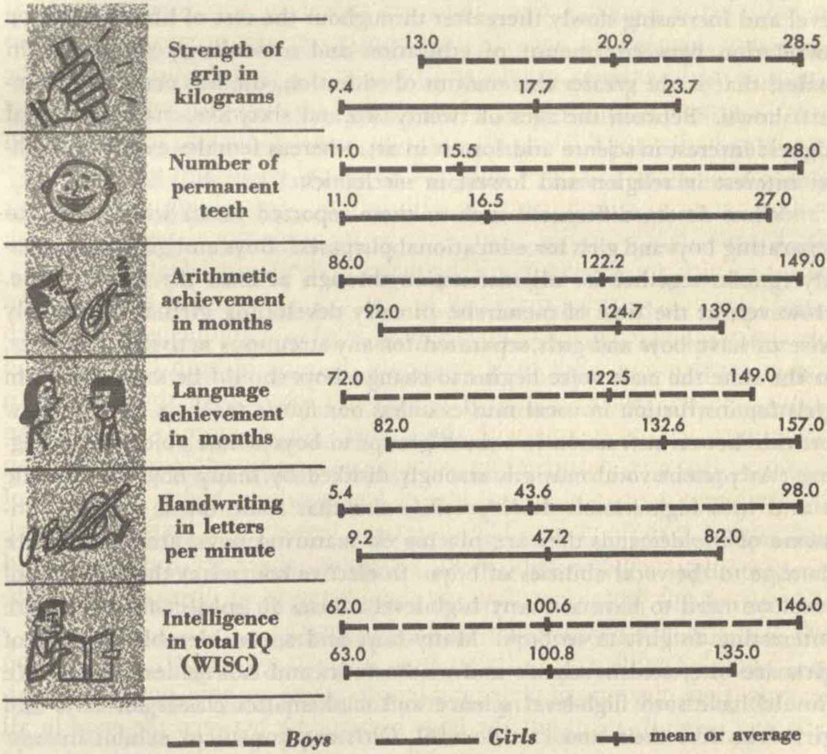


FIGURE 3.8. *(Adapted from Klausmeier, Feldhusen, and Check, 1959.)*

for boys in arithmetic; the girls had a slightly higher mean score. In language and in handwriting speed, the average achievements are higher for girls than for boys, as expected. In all areas except language, a boy had the highest score, and in all areas the overlapping between boys and girls is quite large. This overlap in achievements is of far more significance for learning efficiency than is the small difference between the mean scores of the boys and girls. For example, though the girls as a group have lower strength, there are many girls who can outperform a large number of boys on a variety of tasks where strength is needed. Also, though girls as a group are higher in language, a large number are far below the highest boy.

As suggested previously, Terman and Wechsler standardized their intelligence tests to eliminate sex differences. Part of the material from the standardization that Terman found to differentiate males and females was subsequently used in a test to assess masculinity and femininity. Terman and Miles (1936) found that for males masculinity increased with age until about sixteen and then decreased throughout the rest of life. For girls, femininity increased with age, rising sharply at about the college sophomore level and increasing slowly thereafter throughout the rest of life. A negative correlation between amount of education and masculinity was noted in males; that is, the greater the amount of education, the less masculine interests shown. Between the ages of twenty-two and sixty-five, males expressed highest interest in science and lowest in art, whereas females expressed highest interest in religion and lowest in mechanics.

What do sex differences such as those reported mean with respect to separating boys and girls for educational purposes? Boys and girls can probably remain together for all instruction through at least the fourth grade. However, at the time of menarche in early developing girls it is probably wise to have boys and girls separated for any strenuous activities. Further, at the time the male voice begins to change, boys should be separated from girls for instruction in vocal music, unless our music teachers can somehow provide better instruction in mixed groups to boys whose voices are changing. At present vocal music is strongly disliked by many boys after Grade 5 and into high school. It is possible also that some music teachers, unaware of the demands they are placing on maturing boys, are doing severe damage to the vocal abilities of boys. In elective courses at the high school level we need to have as many high-level courses in subject fields that are interesting to girls as to boys. Many boys and a considerable number of girls are interested in science and mathematics and can achieve highly. We should have such high-level science and mathematics classes for boys and girls who like them and can do well. Girls are known to exhibit interest in music, art, and business education. High-level classes in music, art, literature, home economics, and business education are needed for the girls who want such courses, just as are the courses in physics, trigonometry, and mechanical drawing for the interested and able boys.

HOME BACKGROUND AND SOCIAL CLASS

All of the abilities and characteristics discussed thus far can be appraised through tests or observations of the child in the school situation. There are other forces continuously at work which also affect efficiency of learning. The family, not the school, provides the early education of the child. During kindergarten the child is in school from two to three hours a day. In the elementary grades and high school he is in school from five to seven hours a day. The school week is generally five days and the school year ranges from about thirty-four to forty weeks.

As reported previously in the study of Clancy and Smitter (1953), a high incidence of children having emotional disturbances came from broken homes, from homes where the mother was employed full time, from homes where there was neglect or deprivation of the child, and from homes in which a foreign language was spoken. It should be noted that many emotionally disturbed children also came from homes possessing the opposite characteristics.

Much has been written about a democratic family life, that the home in which decision-making is shared by members of the family, including the children, produces more self-reliant and well-adjusted children than does a home environment characterized by strife or by decision-making by one person, usually the father or the mother. There is much confusion as to the characteristics of a democratic home life, just as there is about a democratic classroom. Additionally, many persons now question the desirability of giving a child of school age equal weight in decision-making with either the father or the mother. Family life in which children accept either or both parents as responsible individuals who, because of experience and the responsibilities of parenthood, must make independent decisions affecting the welfare of the children, can be harmonious. Equally important, family life can be harmonious when children, as early as they are willing and able to accept responsibility for their decisions, share in making decisions.

Sheldon and Cutts (1953) investigated children's reading ability in relation to certain characteristics of the parents, the home, and developmental characteristics of the child. They found that there was a slight tendency for the high achievers in reading to come from homes in which there was parental agreement on methods of control. The important finding was that the two parents agreed on control. It is when the parents disagree on methods of raising the child, particularly in the presence of the child, that the home situation may be a poor one. They also found that the number of parents of high-achieving children who expected the child to attend college was three times greater than that of parents of lower-achieving pupils.

Drews and Teahan (1957) attempted to get some definite information on two opposing points of view with respect to the role of parents and the related effects upon children. One point of view is that if the child is allowed too much freedom he will remain at the mercy of the pleasure principle; a second is that parental restraint upon the child will result in his becoming anxious and lacking in independence and creativity. These researchers identified high- and low-achieving junior high school students with IQ's above 130, and high- and low-achieving students with IQ's ranging from 93 to 120. A parental attitude scale was constructed and administered to the mothers of these high- and low-achieving pupils. The mothers of high achievers were more authoritarian and restrictive in the treatment of their children than were the mothers of the low achievers. The mothers of the high-achieving children of both high and average IQ seemed to have, in addition, more punitive attitudes with respect to child-rearing practices. The question as to whether the more restricted and less permissive home environment resulted in any loss in creativity or independence on the part of the pupil was not answered. However, as achievement was assessed by teachers, the more restrictive and less permissive home environment was associated with higher achievement in both high and average IQ children.

Patterns of home and family life have been related to social-class structure. Warner and his associates (1941) reported their study of social classes in a New England community. Subsequently, many other studies were made of social-class structure in other communities, especially before World War II. Warner developed the basic pattern for categorizing people residing in a community into social classes as shown in Figure 3.9. The three main social classes are upper, middle, and lower, and within each of the three there is an upper and a lower, giving a total of six social classes.

A carefully conducted longitudinal study of social class and its relation to school learning was done by Havighurst and his associates and was subsequently reported by Havighurst and Janke (1944), Janke and Havighurst (1945), and Havighurst and Breese (1947). First, a typical community that represented the ethnic, economic, industrial, social, educational, and agricultural characteristics of the population of the Midwest was identified. Then, the families in the community were classified according to social class. Five distinct social class groups were identified, with a very small number of families, however, in the upper social class. Sixteen different test batteries were administered to the pupils in the school at one or another time during the period of the study. When the children were ten years old it was found that (1) children of higher family social status tended to do better in all of the tests than children of lower social status; and (2) urban children tended to do better than rural children except on the Mechanical Assembly Test for Boys. The correlation coefficients among the tests—Revised Stanford-Binet Scale, the Cornell Coxe Performance Ability Scale, the Iowa Silent Reading Test, the Minnesota Paper Form Board for Boys, the Chicago Assembly Test for Girls, the Porteus Maze Test, and the Goodenough Draw-A-Man Test—were positive and quite high.

Using the same tests and, in addition, the Wechsler-Bellevue (Performance Scale) with the pupils at sixteen years of age, the researchers found that boys and girls from families of higher social status tended to do better on all the tests than boys and girls of lower social position with, again, the exception of the Mechanical Assembly Test for Boys, where there was no social-class difference among the boys; urban boys and girls tended to do better than rural boys and girls, but not significantly so; and no significant sex differences were found. The researchers concluded that differences according to social class, already present at ten years of age, became greater with age.

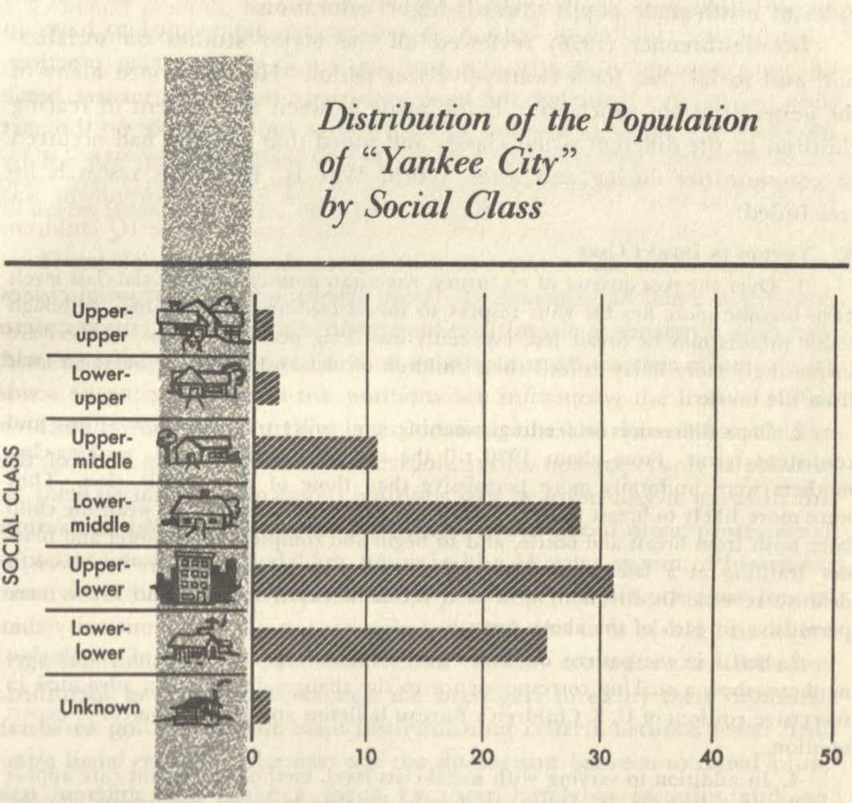


FIGURE 3.9. *(Adapted from Warner and Lunt, 1941, p. 203.)*

The Thurstone Test of Primary Mental Abilities, consisting of seven subtests, was administered to the children at a mean age of thirteen years. Most differences favored the girls, except on spatial ability, which favored boys. Social status and ability correlated quite high and positively on these tests also. The higher correlations were found between social class and subtest scores of Number, Verbal Comprehension, and Word Fluency. High-ability children on all subtests were, however, found in all the social-class groups.

Davie (1953) also used the Warner classifications in studying the relationship between social class and school attendance. He found a direct relationship between social class and school attendance, with a high proportion of students from families of the upper social class going on for higher education and a relatively small number of those from the lower social class continuing into higher education. Hieronymus (1951) similarly found a substantial correlation between social class of parents and the attitudes of ninth-grade pupils towards higher education.

Bronfenbrenner (1958) reviewed all the major studies on socialization and social class for a twenty-five-year period. He questioned many of the generalizations which were being made between the pattern of rearing children in the different social classes and noted that changes had occurred in communities during and after World War II. From his research he concluded:

> A. TRENDS IN INFANT CARE
>
> 1. Over the past quarter of a century, American mothers at all social-class levels have become more flexible with respect to infant feeding and weaning. Although fewer infants may be breast fed, especially over long periods of time, mothers are increasingly more likely to feed their children on demand and to wean them later from the bottle.
>
> 2. Class differences in feeding, weaning, and toilet training show a clear and consistent trend. From about 1930 till the end of World War II, working-class mothers were uniformly more permissive than those of the middle class. They were more likely to breast feed, to follow a self-demand schedule, to wean the child later both from breast and bottle, and to begin and complete both bowel and bladder training at a later age. After World War II, however, there has been a definite reversal in direction; now it is the middle-class mother who is the more permissive in each of the above areas.
>
> 3. Shifts in the pattern of infant care—especially on the part of middle-class mothers—show a striking correspondence to the changes in practices advocated in successive editions of U. S. Children's Bureau bulletins and similar sources of expert opinion.
>
> 4. In addition to varying with social-class level, methods of infant care appear to differ as a function of cultural background, urban vs. rural upbringing, and exposure to particular ideologies of child rearing.
>
> 5. Taken together, the findings on changes in infant care lead to the generalization that socialization practices are most likely to be altered in those segments of society which have most ready access to the agencies or agents of change (e.g., books, pamphlets, physicians, and counselors).
>
> B. TRENDS IN CHILD TRAINING
>
> 6. The data on the training of the young child show middle-class mothers, especially in the postwar period, to be consistently more permissive toward the child's expressed needs and wishes. The generalization applies in such diverse areas as oral behavior, toilet accidents, dependency, sex, aggressiveness, and freedom of movement outside the home.
>
> 7. Though more tolerant of expressed impulses and desires, the middle-class parent, throughout the period covered by this survey, has higher expectations for the child. The middle-class youngster is expected to learn to take care of himself earlier, to accept more responsibilities about the home, and—above all—to progress further in school.
>
> 8. In matters of discipline, working-class parents are consistently more likely

> to employ physical punishment, while middle-class families rely more on reasoning, isolation, appeals to guilt, and other methods involving the threat of loss of love. At least two independent lines of evidence suggest that the techniques preferred by middle-class parents are more likely to bring about the development of internalized values and controls. Moreover, the effectiveness of such methods, should, at least on theoretical grounds, be enhanced by the more acceptant atmosphere experienced by middle-class children in their early years.
>
> 9. Over the entire 25-year period studied, parent-child relationships in the middle class are consistently reported as more acceptant and equalitarian, while those in the working class are oriented toward maintaining order and obedience. Within this context, the middle class has shown a shift away from emotional control toward freer expression of affection and greater tolerance of the child's impulses and desires [Bronfenbrenner, 1958, pp. 424–425].

There is a possibility that social class structure of the 1930's may not be highly appropriate at the present time. Increasingly we have a growing number of persons in managerial types of positions in government, industry, labor, religion, and all other fields. A relatively small number of persons in these managerial and executive positions are influencing the lives of all of us. They are not only making the decisions but also have available the mass media of communications—television, radio, newspapers. It is possible that these persons in managerial positions will be given higher status in the future than will such people as physicians, lawyers, and other professional people who were accorded high status in the Warner system. Physicians, artists, architects, and other professional people yet render great services to society; but they often do not strongly influence the lives of large numbers of persons residing in the community, nor do they attempt to control communications as individuals, though the managers hired by their organizations often do. One of the main distinguishing criteria between lower and middle social classes of the past was the distinction between so-called blue-collar workers who make a living by their hands in factories and on farms and white-collar workers in offices, sales, and other positions. During and since World War II many blue-collar workers make more money than do many in the white-collar occupations. The blue-collar workers are buying many of the same services such as education, medicine, and recreation in as large amounts as many white-collar workers. With the leaders of organized labor consistently and persistently promoting higher education, it is entirely possible that a larger percent of students in higher education in the future will be of laboring-class parents and that many of them will subsequently make significant contributions in many fields of human endeavor.

READINESS FOR LEARNING AND LIMITS OF LEARNING

A pupil's readiness to engage successfully in a learning task such as reading, swimming, playing the violin, learning algebra, or learning psychology is related to the factors just discussed. Intelligence and related cognitive abilities, including previous achievements related to the specific task; psychomotor and related physical characteristics, including health; affective characteristics, including interests, motivation, and emotional well-being; sex; and home background are all important. Considerable advances have been made in constructing tests and developing teacher observation and informal procedures to help teachers assess the readiness of a particular pupil for various classroom learning tasks. Unfortunately, however, many textbooks which are used in the schools and many curriculum guides which place learning materials according to sequential grade levels do not take into account differences in pupil readiness to learn. For example, when all the students who are enrolled in the ninth grade are required to take beginning algebra, it is frequently assumed that they are all equally ready to learn efficiently.

Further, within school systems within the same state some children are being changed from the manuscript to the cursive form of handwriting in the second grade; in other schools the change is made in the third grade; in still others it is not made until the fourth grade. Each school system seems to justify its procedure in handwriting on the basis of research and ideas proposed long ago, by Cutright (1936) for example. Some school systems are still using only IQ tests as the basis for grouping children in the first grade, whereby one group starts with a first-grade reader, another group gets a readiness book, and a third group has conversation instruction. This practice of grouping is related to research done by Gates (1937) in which he reported the necessary mental age for beginning reading as about six and one-half years. The graded sequence in arithmetic in many school systems follows the research reported by Washburne (1931). It is quite obvious to anyone who has recently studied arithmetic achievement in the elementary grades that many children of average intelligence and higher can perform arithmetic learning tasks in the fourth grade which are now placed in the fifth and sixth grade. Russell (1943) reported an excellent study of spelling readiness. Though he established the fact of differences in readiness among first graders to engage profitably in learning to spell, many schools yet give all pupils from first grade through eighth or ninth grade the same list of spelling words included in any of several textbooks for the particular grade level. Many children can learn to spell at a much more rapid rate than that provided by the textbook, whereas many other children are known to make little progress in spelling because the graded list is too long or too difficult for them.

One of the greatest challenges in modern times is to ascertain the maximum limits of learning for pupils of varying intellectual, psychomotor, and affective characteristics. Most persons never come close to reaching the limits of learning possible at any time in their life. Not so long ago it was thought that no one would run the 100-yard dash in less than 10 seconds, the mile in less than 4 minutes, or exceed 6 feet in the high jump. All of these records, of course, have been broken. Also, less than twenty-five years ago children with IQ's below 70 were usually given up as hopelessly mentally deficient and were institutionalized for life. Recently it has been found that many children from the large group with IQ's 55 to 70 can learn enough to become relatively independent as adults. For the large majority of our average and high IQ children at all ages, we have not attempted to find out what the top limits are. There is a tendency instead to be satisfied when the pupil learns as much as he is supposed to according to his grade level—whether the grade level is primary, high school, undergraduate, or graduate at the university. In addition, we do not persistently try to find new means of improving instruction. It is entirely possible that if we set our sights higher with respect to finding the limits of pupil learning and if we worked vigorously toward developing teaching procedures and use of instructional materials which would help each child learn most efficiently, we could greatly raise the level of accomplishments of most human beings by the time they reached adulthood and do this simultaneously with improving mental health, emotional adjustment, and personal integration of the individual.

SUMMARY

A number of pupil characteristics directly affect the efficiency with which they learn: mental maturity and related intellectual abilities, physical maturity and related psychomotor abilities, and affective characteristics such as interests, attitudes, motives, and personality integration. Less directly, age, sex, and home background also influence efficiency of learning.

In large groups of students at any age level, abilities and other characteristics are normally distributed. Only a small percent of a child population is of high or of low intelligence; the large percent is between. The same is true of height, strength of grip, honesty, educational achievements, and other characteristics. Further, only a small percent of the child population is superior in all cognitive, psychomotor, and affective characteristics and only a small percent is low.

Usually low and positive correlations are found between cognitive abilities and psychomotor abilities, between cognitive abilities and affective characteristics, and between psychomotor abilities and affective characteristics. Measures of intellectual abilities are more useful in predicting achievements in the cognitive domain than are measures of psychomotor abilities, and vice versa. Efficiency of learning in the cognitive domain as represented in such fields as the language arts and mathematics is not highly correlated with physical maturation, emotional expression, or character development. At any point in time, an emotional disturbance or physical illness may markedly reduce efficient learning in the cognitive domain. Thus, readiness to learn to read or to add numbers is primarily dependent upon mental maturity and related cognitive abilities; but physical maturity and affective characteristics also are important.

QUESTIONS AND ACTIVITIES

1. (a) From Figure 3.1, give the total percent of subjects with IQ's between 85 and 115, 115 and higher, and 84 and lower. The sum of these should equal 100 percent.
   (b) In which of the three domains discussed in Chapter 2 would you expect the low IQ subjects to be most different from the high IQ subjects? Most like the high IQ?
2. (a) From Table 3.2, give the grade equivalent between which the middle 98 percent of ninth-graders score in language. Do the same for twelfth-graders.
   (b) Discuss what these widespread differences mean for instruction in English.
3. (a) Using the information in Tables 3.4, and 3.5, list the physical characteristics and skills in which boys show a wider range than girls.
   (b) Discuss what the differences among only the boys or among only the girls mean for a program of physical education for ten-year-olds.
4. (a) What did Jersild and Tasch find about interest in various school activities and subjects, primary grades through senior high school?
   (b) Indicate which of the same findings agree with your own observations.
5. (a) What did Hartshorne and May conclude about the incidence of cheating?
   (b) What factors were found to be associated with deceit?
6. (a) In what respects are the distributions for cheating (Figure 3.4), running the 50-yard dash (Table 3.5), and IQ (Figure 3.1) alike?
7. To what extent is emotional disturbance an educational problem?
8. What do the relationships among intelligence, physical characteristics, and affective characteristics suggest about children's readiness for acquiring learning outcomes in the cognitive domain at the elementary school level?
9. (a) State and discuss the main conclusions derived from research on developmental tasks.
   (b) If given the opportunity, would you group children for instruction on the basis of chronological age? Give the reasons for your answer.
10. (a) In which characteristics did Terman and Tyler find boys as a group to be most different from girls?
    (b) Which differences between the sexes are more closely associated with cultural than biological factors?
11. What does Figure 3.8 show about differences among children of the same sex, compared with differences between the sexes?
12. List and discuss briefly three generalizations about the relationship between home background, including social class, and education in school.
13. From the standpoint of your subject-matter interest and the school level in which you are most interested, how would you ascertain a student's readiness to learn?
14. Describe how you decide when you have learned as much and as well as is possible for you.

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Chapter 4 Teacher Characteristics and Efficient Pupil Learning

Teachers are not and should not be identical personalities. Though selected to some extent prior to entering their first positions, they present a wide variety of personal and professional characteristics. Parents, superintendents of schools, and others would probably agree upon a considerable number of characteristics that the teacher should possess: intelligence, a good cultural background, substantial knowledge of the subject matter, and good command of the English language in spoken and written form, for example. The teacher is generally expected to be able to demonstrate perceptual motor skills which pupils are to learn, in music, art, handwriting, physical activities, and the like. Such affective traits as emotional stability, considerateness, buoyancy, and reliability are desired also. In addition, many parents and school officials want the teacher to be interested in the pupil, in the subject matter, in teaching as a career, in school and community affairs where the school is located, and in improving the profession of teaching.

The purpose of this chapter is to examine teacher characteristics that may be related to efficient learning of the usual subject-matter knowledge and skills by pupils and, more broadly, to personality development. In the first part of the chapter, teacher characteristics in the areas of cognitive abilities and intellectual characteristics, psychomotor and related physical abilities, affectivity, and professional competence are treated. Then differences according to age, sex, and social class are examined.

The personal characteristics of teachers, different from pupils, are assumed to be relatively stable; that is, the teacher has matured to a point at which cognitive, psychomotor, and affective characteristics will not change markedly from week to week or even from year to year. In Chapter 5, the ongoing daily behaviors of the teacher are discussed; these are expected to be more situational and less stable than personal characteristics.

COGNITIVE ABILITIES AND INTELLECTUAL CHARACTERISTICS

Many persons have conducted descriptive research in order to predict teaching success. Ratings of success in teaching have been correlated with measures secured on prospective teachers while they were still in college:

intelligence, grade-point average, amount of work taken in major field, and scores on various achievement tests in the subject-matter major, in general education, and in professional education. Criteria of teaching success have included pupils' gain in achievement, supervisors' ratings of the teachers, principals' ratings of the teachers, pupil opinions, and parent opinions. Barr (1955, 1958) has been conducting such research and summarizing his work and that of many other researchers at three-year intervals. Intelligence, grade-point average, preparation in the subject field, and achievement scores of the prospective teacher on various tests show a positive but low relationship with subsequent teaching success. Bright, high-achieving prospective teachers as a group are rated somewhat more successful in subsequent teaching positions than the less bright and lower-achieving. However, the difference is so small that hiring officials, for example, usually are not interested in learning the IQ of teachers they are considering for positions, and many show only moderate interest in grade-point average, so long as it is high enough for the candidate to be graduated.

Why are high intelligence, good preparation while in college, and high achievement not more highly correlated with later teaching success? First, most prospective teachers who are graduated have above average intelligence, average or above average achievement while in college, and fairly good preparation in one or more subject-matter fields. Most beginning teachers have sufficiently high intelligence and cognitive abilities to be successful. Second, the criteria of teaching success are often not well established in the varying situations in which teachers work. For example, supervisors or principals do not use the same criteria in judging teaching success. Third, it is possible that somehow our educational arrangements have become so institutionalized that the very bright and high-achieving students in college do not accept a first position, do not teach for an extended number of years, or do not subsequently find challenges in a teaching position. A large number of highly intelligent, high-achieving teachers are found in classrooms from kindergarten through twelfth grade. One would expect that a considerable amount of children's literature, literature for adolescents, musical compositions suitable for children's use, and art objects would be produced by these intelligent and high-achieving teachers. This is not the case at present. Apparently, the teachers who show considerable creativity and produce literature, art, or music do not remain long in the classroom but go into other fields. Further, neither society generally nor teachers themselves appear to accept productivity in music, art, literature, or other fields as desirable activity in addition to teaching.

At no point, however, has research shown that being intelligent, achieving high while in college, or getting a good general education is a handicap to teaching. Shannon (1940) compared highly successful teachers, failing teachers, and average teachers. Those teachers who were considered excellent to the point of being distinguished were found to have higher IQ, higher grade-point average, and greater participation in extracurricular activities while in college than were those judged to be average or failures. Shannon found little difference in intelligence, grade-point average, and participation in extracurricular activities between the teachers judged to be average and those judged to be failures.

Ryans (1958) invited principals to nominate only highly superior and exceedingly poor teachers. The principals nominated 43 superior and 27 poor elementary teachers, 85 superior and 70 poor English–social studies teachers, and 82 superior and 71 poor mathematics–science teachers. The elementary teachers represented thirty states; the English–social studies teachers, thirty-two states; and the mathematics–science teachers, thirty-eight states. In no case did a principal suggest that a poor teacher had too much subject-matter preparation. On the contrary, 36 percent of the poor English–social studies teachers were judged poor because of lack of subject-matter teaching ability, and 61 percent of the superior mathematics–science teachers were said to possess ability to teach subject matter as their outstanding characteristic.

Grades made by prospective teachers in such courses as child development, educational psychology, methods of teaching, and student teaching are also not found to correlate highly with subsequent teaching success; however, the grade made in student teaching generally is more closely related to subsequent success than is the grade made in any other college course or group of courses, including the major field of study. This is apparently because student teaching is more like actual teaching than any other combination of educational experiences the prospective teacher has.

Teachers' application in the classroom of increased knowledge of their pupils or of child development and learning has been found to increase efficiency of pupil learning in the usual subject-matter areas and to foster personality development of pupils. Hoyt (1955) studied the effect of teacher knowledge of pupil characteristics on pupils' achievements and attitudes toward class work. The experiment was conducted with eighth-grade students in English, mathematics, and social studies in two junior high schools. One group of teachers was given no information about the pupils. A second group of teachers was given the results of an intelligence test for each pupil and achievement test results in English, social studies, and mathematics. This group of teachers was given no further information. A third group was given all the test information plus a pupil information blank for securing other information and was encouraged to discover all they could of significance about each pupil. Further, Hoyt worked with the teachers of the last two groups in helping them to understand the information. He found that knowledge of the pupils' characteristics did not in itself result in an increase in pupil achievement in mathematics, social studies, or English.

Also, the knowledge did not affect one sex more or less than the other or one ability level—high, average, or low—more than another. The achievements of pupils whose teachers knew their characteristics were no lower in any of the subject fields, and in English they were higher. However, because of the nature of the data, a final conclusion could not be drawn to the effect that the increased knowledge led to higher English achievement. Hoyt did conclude positively that the increase in teacher knowledge of pupil characteristics improved pupil attitudes toward the teachers.

The effect on pupil growth of an increase in teacher understanding of pupil behavior was studied by Ojemann and Wilkinson (1939). Considerable information about each pupil was given to the experimental group of teachers, and the investigator assisted the teacher in understanding the information. Pupils in the experimental group made a significantly greater academic gain than did the control group—pupils whose teachers were not given information. Further, the pupils in the experimental group showed better attitudes toward school and better general adjustment to school and to their classmates than did those in the control group. Knowing the pupils well resulted in more effective guidance of academic learning and in better personality development in the pupil.

Teachers of varying intellectual abilities and other cognitive characteristics always operate in particular school situations. The interactions of the teacher in the situation are important and will be discussed more fully in Chapter 5. At this point an excellent study of both characteristics and behaviors is examined. Schunert (1951) investigated the relationship between mathematical achievement of high school pupils and certain factors resident in the teacher, in the teaching process, in the pupils, and in the school. He secured a stratified random sample of the entire population of the Minnesota high school pupils who were enrolled in algebra and in geometry courses. The final sample contained 3919 pupils in 102 elementary algebra classes and in 94 geometry classes. From this large sample he obtained achievement measures of the pupils, other characteristics of the pupils, characteristics of their teachers, characteristics of the teaching practices employed, and characteristics of the school in which the pupils were enrolled. A synthesis of his conclusions follows:

1. Sex of pupils was not related to achievement in algebra, but it was in geometry, where boys achieved higher than girls.
2. Higher achievement was found in the schools with enrollments of 100 to 500 rather than in smaller or larger schools.
3. Higher algebra achievement was found in classes of 20 to 30 pupils.
4. Algebra classes taught by teachers with more than eight years of experience achieved significantly higher than classes taught by teachers with less than eight years of experience.

5. Algebra classes taught by teachers who were graduates of state universities or privately operated schools achieved significantly higher than classes taught by graduates of state teachers colleges.
6. Algebra classes in which differentiated assignments for pupils were used achieved significantly higher than classes where they were seldom or never used.
7. Algebra classes in which life applications of mathematics were regularly studied achieved significantly higher than those where life applications were not studied.
8. Supervised study of 20 to 30 minutes per class period in both algebra and geometry resulted in higher pupil achievement than did less supervised study.

Equally interesting were some factors not associated with algebra achievement: sex of pupil, previous education in rural or urban schools, type of secondary school, and amount of the teachers' education in mathematics. In geometry also, a number of factors, including years of previous teaching experience, the amount of the teachers' education in mathematics, and the type of institution from which the teacher was graduated, were found not related to pupil achievement.

In summary, efficiency of pupil learning is increased by a teacher who is intelligent, well prepared in the subject-matter field, a high achiever while in college preparing for teaching, and generally well educated. Unfortunately, research has not yet shown that the highly superior individuals perform as well as might be expected and, in part, this may be a product of our institutionalizing education to a point at which highly creative, productive individuals somehow do not reach the high levels anticipated when they were college students or they do not remain in teaching.

PSYCHOMOTOR ABILITIES

An important objective of education is to help learners acquire skill in such activities as handwriting, shorthand, typing, mechanical drawing; in dance, the fine arts, instrumental and vocal music; in manipulating such materials as wood, metals, fabrics, chemicals; in using tools and measuring and recording devices in the sciences, arts, and other fields. To perform motor activities efficiently, strength, speed, precision, coordination, and flexibility are required; still other skills may be required in superior vocal performances. To what extent should the teacher be highly skilled in the perceptual motor skills that the learners should acquire?

An important instructional principle related to perceptual motor learning is that the teacher should understand the nature of the skill to be taught and should be able to demonstrate it. It is assumed, for example, that, if children are to acquire efficiency in handwriting, the teacher must understand the nature of handwriting, provide a good model, and be able to help children overcome errors. In foreign language instruction also, the teacher must speak the language well if children are to learn efficiently from imitating the teacher. Similarly, in music, art, home economics, agriculture, and other fields, it is considered desirable for the teacher to be able to demonstrate the skills to be learned. The general recommendation for guiding experimentation by pupils in science is that the teacher should first have conducted the experiment himself and be able to demonstrate it. Good psychomotor abilities and related physical characteristics are probably as essential in some fields of teaching as are verbal or mathematical abilities in other fields.

AFFECTIVE CHARACTERISTICS

The range of differences among teachers in interests, attitudes, and values, and over-all personality organization is greater than in intelligence and related cognitive abilities and is of more significance generally than differences in psychomotor abilities. Certain standardized information-gathering devices such as the Strong Vocational Interest Blank for Men and the Strong Vocational Interest Blank for Women, the Minnesota Teacher Attitude Inventory, and the Rorschach Ink Blot Test have come into considerable use as appraisal devices in the affective area. (These and other tests are described in Chapter 15.)

Interests

Schultz and Ohlsen (1955) used supervisors' ratings to identify most and least successful student teachers. The final group consisted of 28 male and 22 female most successful student teachers and 29 male and 19 female least successful student teachers. The student teachers were administered the appropriate form of the Strong Vocational Interest Blank. Analysis of the results led to the conclusion that the most successful group showed high social service and intellectual interests. The least successful student teachers showed lower interest in social service occupations and intellectual pursuits but higher interests in working with things, working by themselves, and working with people in a manipulative capacity for purposes of personal gain.

Ryans (1959) used a self-report type of inventory with 67 teachers of various grades and subject-matter fields judged to be more effective teachers and 37 teachers of various grade levels and subject fields judged to be relatively ineffective Tables 4.1 and 4.2 show Ryans' findings, not only for interests, but also for other characteristics to be discussed later in this chapter. The better elementary teachers in the group indicated high interest in reading and in literary matters; in music, painting, and the arts in general; in science and scientific matters; and also indicated preferences for activities which involve contact with people. The better secondary school teachers indicated high interest in reading and in literary matters and in music and painting and the arts in general. The less effective teachers did not show similar high interests in these areas. Thus, interest in people generally, in

TABLE 4-1. ***Personal Qualities Which Appear to Distinguish Teachers Selected to Be "High" and "Low" with Respect to Over-all Classroom Behavior: Characteristics of "High" Group Teachers***

Elementary Teachers	Secondary Teachers	Elementary–Secondary Teachers Combined
A. "High" group members more frequently (than "low"):	A. "High" group members more frequently (than "low"):	A. "High" group members more frequently (than "low"):
1. Manifest extreme generosity in appraisals of the behavior and motives of other persons; express friendly feelings for others.	1. Manifest extreme generosity in appraisals of the behavior and motives of other persons; express friendly feelings for others.	1. Manifest extreme generosity in appraisals of the behavior and motives of other persons; express friendly feelings for others.
2. Indicate strong interest in reading and in literary matters.	2. Indicate strong interest in reading and in literary matters.	2. Indicate strong interest in reading and in literary matters.
3. Indicate interest in music, painting, and the arts in general.	3. Indicate interest in music, painting, and the arts in general.	3. Indicate interest in music, painting, and the arts in general.
4. Report participation in high school and college social groups.	4. Report participation in high school and college social groups.	4. Report participation in high school and college social groups.
5. Manifest prominent social service ideals.	5. Judge selves high in ambition and initiative.	5. Judge selves high in ambition and initiative.
6. Indicate preference for activities which involve contacts with people.	6. Report teaching experience of four to nine years.	

7. Indicate interest in science and scientific matters.	7. Report teaching type of activities during childhood and adolescence.	
8. Report liking for outdoor activities.	8. Indicate preference for student-centered learning situations.	
9. Are young or middle-aged.	9. Manifest independence, though not aggressiveness.	
10. Are married.		
11. Report that parental homes provided above-average cultural activities.		
B. "High" group on the average (compared with "low"):	B. "High" group on the average (compared with "low"):	B. "High" group on the average (compared with "low"):
1. Indicates greater enjoyment of pupil relationships (i.e., more favorable pupil opinions).	1. Indicates greater enjoyment of pupil relationships (i.e., more favorable pupil opinions).	1. Indicates greater enjoyment of pupil relationships (i.e., more favorable pupil opinions).
2. Indicates greater preference for nondirective classroom procedures.	2. Indicates greater preference for nondirective classroom procedures.	2. Indicates greater preference for nondirective classroom procedures.
3. Is superior in verbal intelligence.	3. Is superior in verbal intelligence.	3. Is superior in verbal intelligence.
4. Is more satisfactory with regard to emotional adjustment.	4. Is more satisfactory with regard to emotional adjustment.	4. Is more satisfactory with regard to emotional adjustment.

Source: *Adapted from Ryans, 1959, pp. 9–10.*

***TABLE 4.2.** Personal Qualities Which Appear to Distinguish Teachers Selected to Be "High" and "Low" with Respect to Over-all Classroom Behavior: Characteristics of "Low" Group Teachers*

Elementary Teachers	Secondary Teachers	Elementary–Secondary Teachers Combined
A. "Low" group members more frequently (than "high"):	A. "Low" group members more frequently (than "high"):	A. "Low" group members more frequently (than "high"):
1. Are from older age groups.	1. Are from older age groups.	1. Are from older age groups.
2. Are restricted and critical in appraisals of the behavior and motives of other persons.	2. Are restricted and critical in appraisals of the behavior and motives of other persons.	2. Are restricted and critical in appraisals of the behavior and motives of other persons.
3. Are unmarried.	3. Indicate preference for teacher-directed learning situations.	3. Value exactness, orderliness, and "practical" things.
4. Indicate preferences for activities which do *not* involve close contacts with people.	4. Value exactness, orderliness, and "practical" things.	4. Indicate preferences for activities which do *not* involve close contacts with people.
	5. Indicate preferences for activities which do *not* involve close contacts with people.	
B. "Low" group on the average (compared with "high"):	B. "Low" group on the average (compared with "high"):	B. "Low" group on the average (compared with "high"):
1. Is less favorable in expressed opinions of pupils.	1. Is less favorable in expressed opinions of pupils.	1. Is less favorable in expressed opinions of pupils.
2. Is less high with regard to verbal intelligence.	2. Is less high with regard to verbal intelligence.	2. Is less high with regard to verbal intelligence.
3. Is less satisfactory with regard to emotional adjustment.		3. Is less satisfactory with regard to emotional adjustment.

SOURCE: *Adapted from Ryans, 1959, p. 11.*

social service activities, in intellectual pursuits, and in the fine arts is more characteristic of successful than unsuccessful teachers.

Attitudes and Values

Teachers' attitudes toward behavior problems of children have been repeatedly investigated. Wickman (1928) reported marked differences between teachers' and clinicians' judgments about what constitutes serious behavior problems in children. Teachers in Wickman's study rated as most serious aggressive behaviors such as stealing, truancy, cheating, and impertinence. Experts, on the other hand, rated as most serious withdrawing and unhappy behaviors such as shyness, fearfulness, and suspiciousness. Ellis and Miller (1936) found somewhat the same pattern, as shown in Figure 4.1, with mental hygienists judging as most serious such behaviors as withdrawing, suspiciousness, unhappiness, resentfulness, fearfulness, cruelty, being easily discouraged, suggestibility, overcriticalness, and sensitiveness. Teachers judged as most serious forms of behavior stealing, heterosexual activity, unreliableness, and untruthfulness. However, as shown in Figure 4.1, the Denver teachers were more like the experts than were Wickman's teachers.

Somewhat like Ellis and Miller, Stouffer (1956) concluded that high school teachers had changed their attitudes somewhat but that clinicians or mental health experts had changed very little since 1927. Apparently because of the role high school teachers must assume, they still rated as most serious extrovertive actions of the pupils such as impatience, destroying school property, disobedience, interest in the opposite sex, and profanity and inquisitiveness. The mental hygienists still rated withdrawing behaviors as being most serious.

Beilin (1959) summarized the research since 1927 which has followed the pattern of the Wickman study and concluded as follows:

1. Differences existed in 1927 between the attitudes of teachers and clinicians toward the behavior problems of children. This seems to have been true in spite of the methodological limitations of the Wickman study.
2. Since 1927 there has been a shift in the hierarchy of teachers' attitudes to approximate more closely those of clinicians. This shift is not due to an artifact of research methodology. Those studies which incorporate adequate controls and consistent instructions show even greater congruence between the attitudes of the two groups.
3. There has been some change in the attitude of clinicians although this is based upon the conclusions of one study.
4. Criteria employed in evaluating the behavior problems of children differ for elementary and secondary school teachers.
5. More boys are identified as maladjusted than girls and the criteria of maladjustment (and adjustment) differ in part for each sex.
6. The sex of the teacher affects, in part, attitudes toward children's problems.
7. Studies of the relationships of socioeconomic factors to the evaluation of children's behavior problems are inadequately dealt with in the literature.

A Partial List of Behavior Problems with Ratings by Mental Hygienists and Two Groups of Teachers

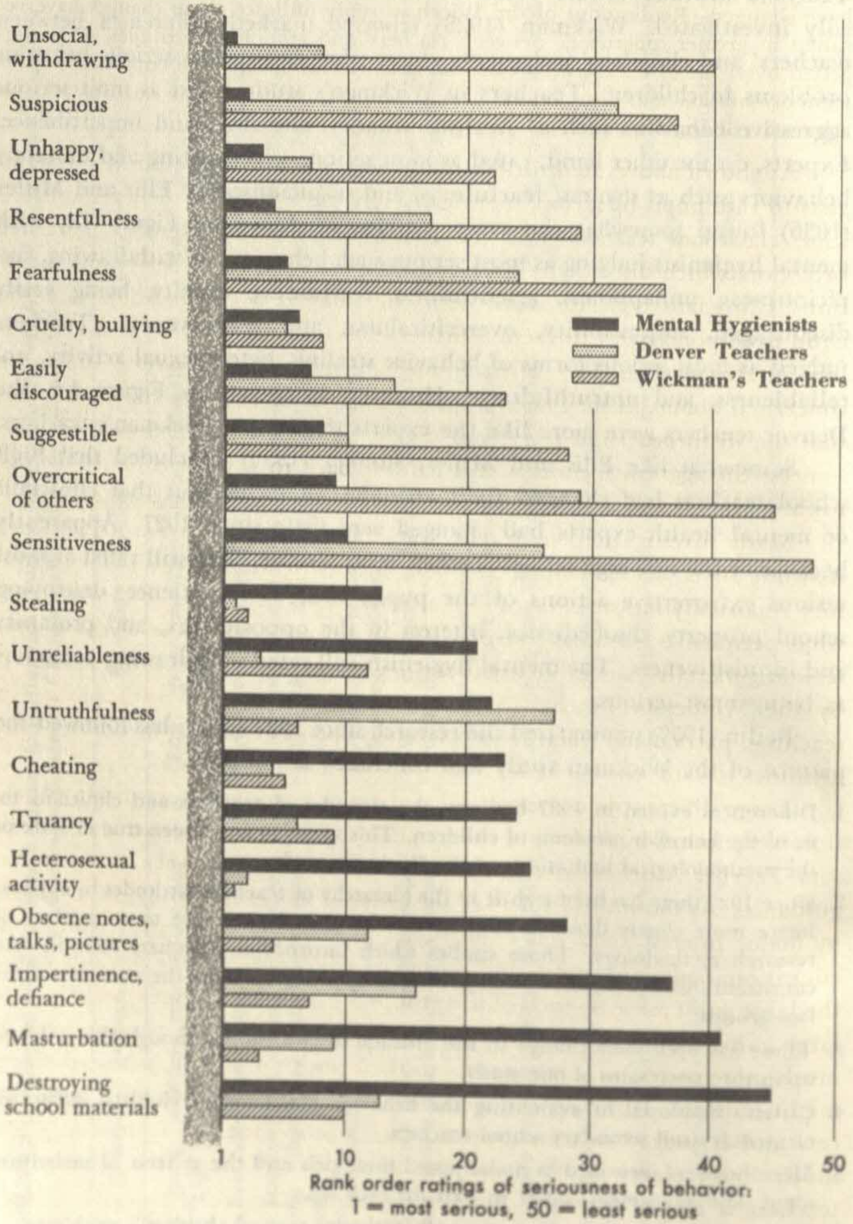

FIGURE 4.1. *(Adapted from Ellis and Miller, 1936, p. 505.)*

> Differences in attitudes between teachers and clinicians are interpreted in the framework of role theory. The attitudinal hierarchies of teachers and clinicians are seen as reflecting their respective roles and the ways these roles influence the organization of their respective experiences. Wickman's findings of 1927 are interpreted as indicative of the role of the teacher in that era. The role expectations of teachers have changed. Replications of the Wickman study indicate these changes have resulted in greater congruence between teachers' and clinicians' attitudes. It is suggested by virtue of the teachers' essential task-orientation and the clinicians' adjustment-orientation that complete or nearly complete congruence is not likely to be achieved [Beilin, 1959, p. 22].

As shown above, Beilin does not expect teachers and clinical psychologists to rate pupil behaviors identically. By the nature of their responsibilities, classroom teachers must be concerned about boisterous, aggressive behaviors which disturb the class and interfere with an orderly work situation. Clinicians typically work with one child at a time. They want the child to respond freely to them. Further, the clinician, because of his role, is less concerned about the child's immediate aggressive behaviors and more concerned about his long-term adjustment. Withdrawal behavior indicates that the disturbed child has given up the fight against frustrating circumstances; the aggressive child is still fighting back to achieve a better feeling toward himself and is therefore considered to be less seriously maladjusted.

Many investigations in recent years have used the Minnesota Teacher Attitude Inventory developed by Cook, Leeds, and Callis (1950). The inventory reportedly measures favorable attitudes toward pupils, toward a somewhat permissive teaching–learning situation, and toward the teaching profession generally. Desirable attitudes toward pupils and teaching measured by the Minnesota Teacher Attitude Inventory correlate with success in teaching, particularly when success is based upon developing favorable pupil attitudes toward school, the learning process, and the teacher.

Large differences in the attitudes of various groups of persons in education were found by Shaw and others (1952). They administered the Minnesota Teacher Attitude Inventory before and after a two-week workshop in guidance. As shown in Table 4.3, the order of scores from highest to lowest by major interest areas was educational psychology, elementary education, educational administration, and secondary education. Table 4.3 also shows the large gains made by each of the groups during the two week period. The large gains should not be interpreted to mean that these persons were as much more successful subsequently in their positions as the increased scores might indicate. However, the workshop has been continued with high success and is judged to contribute to the improvement of education. The much lower scores received by the secondary teachers than elementary teachers is also of interest. Apparently, elementary teachers have a more favorable attitude toward children and are less interested in subject matter than are secondary teachers. Klausmeier and others (1951) found that pros-

TABLE 4.3. Comparison of the Scores Made by the Workshop Members on the Minnesota Teacher Attitudes Inventory on the Initial Test and Retest According to Major Field of Study

	Major Field of Study								Total Group	
	Ed. Psych.		Ed. Admin.		Elem. Ed.		Sec. Ed.			
	Initial Test	Retest	Initial Test	Retest	Initial Test	Retest	Initial Test	Retest	Initial Test	Retest
N	23	23	30	30	49	49	56	56	158	158
Mean	65.1	79.7	49.3	67.7	57.6	70.1	46.1	64.8	53.0	69.2
S.D.	27.9	11.8	22.4	20.0	17.7	18.9	28.2	22.0	25.5	16.0
$t_{(M_I - M_R)}$	2.66		4.40		3.43		6.13		11.17	
Probability less than	.02		.001		.01		.001		.001	

SOURCE: *Shaw et al., 1952, p. 305.*

pective elementary teachers were highly interested in working with children, whereas prospective high school teachers were primarily interested in a major subject field. Also, the attitudes toward children were found more favorable among prospective elementary than prospective high school teachers.

The Allport-Vernon Study of Values (1931) has shown that men generally obtain higher scores for theoretical, economic, and political values than women, whereas women obtain higher average scores for aesthetic, social, and religious values. Values held by men and women generally may apply to teachers and are being given serious research consideration in recent years.

Dilley (1957) developed a scale for measuring personal values and administered it to 202 students preparing for teaching and 64 students preparing for engineering. The values which most markedly differentiated the teacher group from the engineer group were desire for contact with children or adolescents and opportunities to help people, with the teacher group being higher in these two values. For all the prospective male and female teachers and for the exclusively male engineering students, items dealing with marriage and children had first preference. In addition, the correlations between the engineer and teacher scores were quite high, indicating that both groups of young people were using the same social norms in their valuing process. The differences between males and females and between engineering and education students were not as large as are usually found in general population of males and females.

Personality Organization

Personality organization has been found extremely difficult to assess. It is generally assumed that the teacher who has favorable attitudes toward self and others, is realistic about self and others, accepts self, and works with vigor and enthusiasm toward socially acceptable goals connected with teaching and personal living is more desirable in the classroom and achieves better results than does one who does not possess these characteristics. Gowan (1955) using the Minnesota Multiphasic Inventory, found that individuals who were responsible, controlled and friendly, and secure and who had strong egos made good teachers. The inference is that individuals who are irresponsible, unfriendly, or insecure do not become successful teachers.

Similarly, Symonds and Dudek (1956), using the Rorschach Ink Blot Test, found four factors to differentiate superior from inferior teachers: superior personality organization, good judgment and reasoning, capacity to relate to others, and low aggression. In both these studies small samples were used. Since both the Minnesota Multiphasic Inventory and the Rorschach were developed and standardized on disturbed rather than normally functioning individuals, their use with large samples of teachers in ascertaining effectiveness remains to be validated.

Travers (1952), using a sentence-completion test before and after first student teaching experience, found that the two greatest sources of potential anxiety among prospective elementary teachers were discipline of the class and the fear of not being liked by the class. Significantly, no change occurred in these anxieties during the student teaching experience of these prospective teachers. Although these anxieties may have been somewhat realistic, anxieties about discipline and being liked by pupils are associated with two conditions: inadequate previous experience with children or lack of stable personality organization. Further, though we know that certain attitudes and values are desirable for teachers and that teaching efficiency requires a well-organized personality, we do not know how to develop these in prospective teachers, nor can we select for teaching only those students who possess them.

PROFESSIONAL COMPETENCES

The major portion of this book is intended to help the educational worker acquire and apply principles of learning, of growth and development, and of evaluation and measurement to individuals and groups of pupils. Klausmeier and Swanson (1950) reported on the development of a functional course in educational psychology for teachers. While graduate students at Stanford University, they were given responsibility for a course in educational psychology for three consecutive quarters in order to achieve the three objectives as listed above and others. The usual instructional procedures included lecturing and using sound films, textbooks, and other instructional material. In addition, the students observed classrooms, kindergarten through Grade 12, made a case study of an individual child, and participated in small discussion groups. These activities were highly valued by the students. Most students demonstrated, as a result of the course, better understanding of individual differences, motivational procedures, effective practice arrangements, and techniques for evaluating the effectiveness of school learning. A small minority of the students did not demonstrate increased understanding or competence and were reported as doubtful candidates for the teaching profession.

The importance of educational psychology in successful teaching was studied by Davis (1940), who ascertained the most frequently occurring problems of public school teachers as revealed in their written statements to a questionnaire. The respondents were from schools of 3 to 139 teachers. The range of experience was from one to forty-one years in the elementary school with a median of ten years. In the junior high school the range was from one to thirty-seven years of teaching experience with a median of six years, and in the senior high school the range was from one to thirty-eight years with a median of five years. The 1075 public school teachers' responses by rank order are shown in Table 4.4. The problem most frequently mentioned at all school levels was motivation. This was followed by testing and evaluation, diagnosing and correcting difficulties, modes of presentation, individual differences, how to study, and so on.

If somehow these experienced teachers could have handled the problems listed more adequately, learning efficiency by pupils might have been markedly increased. The body of principles and generalizations set forth in this book is intended to help educational workers deal more effectively with ongoing and recurrent problems of instruction.

TABLE 4.4. Ranking of Major Problems According to Educational Levels

Type of Problem	Educational Level			
	Elementary School	Jr. High School	Sr. High School	All Levels Combined
Motivation	1	1	1	1
Testing and evaluation	3	2	2	2
Diagnosing and correcting difficulties	2	4	4	3
Modes of presentation	5	3	3	4
Individual differences	4	5	5	5
How to study	9	6	7	6
Transfer of training	11	8	6	7
Relationships with administration	6	10	9	8
Lack of equipment and materials	10	12.5	8	9
Curricular and extracurricular activities	8	11	12	10
Thoroughness and mastery	7	12.5	13.5	11
Discipline	14	7	10	12
Pupil participation in class	13	9	11	13
Guidance	15	14	13.5	14
Racial differences	12	15	16	15
Parent-teacher relations	16	16	15	16

SOURCE: *Davis, 1940, p. 45.*

AGE

Relatively little research has been done on the effectiveness of teachers at various ages. Superintendents of schools and other hiring officials recognize, however, that it is wise not to have a school staff comprised of teachers almost exclusively above or below age forty-five. Officials of large colleges and universities as well as public school systems recognize that unmarried female teachers in the age range of forty to fifty-five often experience rather severe emotional problems during menopause. At the same time, the present tendency is to re-examine compulsory retirement for men and women teachers at age sixty-five with a view to extending it to age seventy or even beyond. Thus, while there are differences among younger, middle-aged and older teachers as groups, some older individuals are exceedingly good teachers, whereas others are exceedingly poor, and the same holds for the middle and younger groups.

Ryans (1959), as shown previously in Table 4.2, found that the older elementary and secondary teachers showed least desirable classroom behaviors. Since this is only one study, the conclusion must remain tentative. However, the evidence about aging on groups other than teachers is quite extensive.

Wechsler (1942) found a gradual but nevertheless constant decline in intelligence test scores after age twenty-five. During the age span twenty-five to sixty-nine verbal abilities showed less decline than nonverbal abilities. Wechsler concluded, however, that the loss of intellectual abilities with age might well be offset by greater experience of the older people when intelligence in the broad sense was considered. Anastasi (1956), also using the Wechsler Adult Intelligence Scale, found declining performance with age but suggested that this decline might, in part, result from the population on which the scale was standardized.

Korchin and Basowitz (1957) identified and studied an old and a young group of adults. The young group consisted of twenty-four individuals between the ages of twenty-two and thirty-three years and included twelve resident physicians and twelve graduate nurses. The old group consisted of thirty-six residents of an institution for the aged, evenly divided by sex within three age groups sixty-five to seventy-four, seventy-five to eighty-four, and above eighty-five. All individuals were in good general health, free from organic brain pathology, and had acceptable corrective vision. These persons were given three paired-associate learning tasks which differed in the degree to which prior experience might be expected to facilitate or block their present learning. The tasks consisted of familiar word pairs, nonsense equations, and false equations. The following conclusions were drawn concerning the younger and older groups:

> Both groups performed best on the word-associate task, but there was little difference between the learning of nonsense and false equations within either group. On all three procedures the old group was significantly poorer, but they were proportionately more deficient in the learning of materials in which the facilitative effects of prior experience are minimized, i.e., the two forms of equations. However, they had no greater difficulty with the interference than with the nonsense material. The older person thus seems to be less capable in dealing with novel material which can not be readily integrated with earlier experience.

> Older and younger Ss were also found to differ in their behavior during learning. Younger Ss are more likely to offer hypotheses, whether correct or incorrect, and through learning to have an increasing proportion of their errors responses which though correct elsewhere in the series are incorrect for the particular stimulus. By contrast, the old Ss respond correctly or not at all, and the proportion of "no response" errors remains high through learning. Three factors are discussed as joint reminders of this behavior: older persons are more cautious; they require more time to integrate response; and their learning may consist mainly of discrete stimulus-response associations, not preceded by more general learning. These factors are conceived as related parts of the total aging process [Korchin and Basowitz, 1957, p. 69].

Birren and Botwinick (1955) studied the perceptual abilities of thirty individuals of age nineteen to thirty-six and of forty-three, age sixty-one to ninety-one. The older age group consistently performed less well than did the younger group. In addition, as the difficulty of the perceptual task increased, the older age group required a longer response time.

Miles (1933) reported the average performances of different age groups in visual perception, in motor skills, and in comparison and judgment. As shown in Table 4.5, the decline in visual perception is sharp after age thirty to forty-nine, from 93 to 76 percent; and in motor skills the decline is sharp after age fifty to sixty-nine, from about 90 to 70 percent. In motor skills and in comparison and judgment the decline amounts to only 1 to 13 percent between the age groups thirty to forty-nine and fifty to sixty-nine.

TABLE 4.5. Average Performance of Different Age Groups on Various Tests[a]

Performance	B (10–17) %	C (18–29) %	D (30–49) %	E (50–69) %	F (70–89) %
Visual perception	100	95	93	76	46
Motor skills					
Rotary	90	100	97	89	72
Reach and grasp	92	100	98	88	70
Finger extension	87	100	98	99	71
Foot reaction	85	100	96	94	71
Comparison and judgment	72	100	100	87	69

[a] 100 indicates highest group average. Others are stated as percentages of this.

SOURCE: *Based on Miles, 1933, pp. 113–116.*

Fisher and Birren (1947) found that among male industrial workers the peak of strength came during the twenties, with a gradual decline thereafter until age sixty when the average strength was about 16.5 percent less than at age twenty. Kay (1951), studying serial learning performances, reported that the difference between the twenty-year-olds and thirty-year-olds was primarily a matter of speed, with the thirty-year-olds showing a loss; the difference between the thirty-year- and forty-year-olds was more a matter of accuracy, with the older group again showing a loss. After age fifty there was a marked decline in both speed and accuracy in a relatively simple motor task involving the turning out of lights by pressing telegraph keys in a serial order.

Lehman (1954) reported little difference from one country to another or from one historical period to another in the age of outstanding performances. Generally, best production in games and sports is achieved prior to age twenty-nine; in science, prior to age thirty-five; and in literature, medicine, and philosophy, prior to age forty. Though the high incidence of outstanding performances is in early life, eminent achievements have been made by persons up to age eighty, and even beyond, in such fields as literature, medicine, music, philosophy, government, and science.

What the general decline in most abilities after about age forty-five to fifty means for the teaching profession is not clear. We yet have much to learn about the psychological and sociological factors of aging, especially as applied to the interaction between pupils of varying ages from kindergarten through college and teachers of varying ages from about twenty to seventy. Birren's review of research (1958) on aging and psychological adjustment suggests that a high frequency of major personal adjustments required by changes in the environment, in health, and in interpersonal relations makes old age a very dynamic period.

It is entirely possible for a teacher to work up to age sixty-five or seventy if good physical and mental health can be maintained, if the daily interactions with pupils do not become a source of irritation or anxiety, if the teacher throughout professional life keeps up with the subject matter, and if the teacher accepts becoming older and approaching retirement with equanimity. The early years of teaching for the younger group, age twenty to twenty-five, for the middle-aged, especially women teachers, and for those above sixty appear to be the periods in which most difficulties are experienced.

SEX

Sex differences in interests, attitudes and values are revealed in the choice of level of teaching. Teachers in the nursery school, kindergarten, and primary grades are almost exclusively female; with the percent of male teachers rising progressively through the intermediate grades, junior and senior high school, and college-level teaching. The large number of superintendents of schools are male, and a large percent of high school and elementary principals are also. Teaching fields such as science and mathematics are heavily dominated by males, whereas other teaching fields such as business education and English have many females. Agriculture teachers are male and home economics teachers are female. Both biological factors inherent in the male and female and cultural factors which delimit appropriate roles for males and females contribute to the choice of teaching level and subject field.

Tyler (1956) presents an excellent summary of sex differences in the population generally. She reports that males tend to be higher in mathematical reasoning, spatial judgment, and science, whereas females average higher in verbal fluency, rote memory, perceptual speed, and dexterity. These are average and often small differences; the differences between the average scores of males and females in verbal fluency, for example, is not nearly so large as the differences within each sex. Much larger differences exist between males and females in interests, attitudes, and personality characteristics, although there is considerable overlapping between the sexes in these characteristics also. Men show high interest in mechanical and scientific activities; physically strenuous, adventuresome activities; legal, political, and army occupations; selling activities; certain forms of entertainment such as chess; and miscellaneous activities such as outside working for oneself and the like. Women show high interests in musical and artistic activities, literary activities, social affairs, clerical work, teaching, social work, window-shopping, and other miscellaneous characteristics. Men tend to value theoretical, economic, and political values highly, whereas women tend to value aesthetic, social, and religious values highly.

Some differences between males and females generally, as outlined from Tyler, have been studied in teachers. Beilin (1957) interviewed men and women high school teachers to ascertain their use of criteria of adjustment. Each teacher was asked to nominate the three best-adjusted and the three least-adjusted students, regardless of sex, in the school. The male and female teachers used much the same criteria of adjustment in their nominations; however, the men teachers were more inclined to value maturity, good judgment, dependability, and trustworthiness and also tended to characterize the best-adjusted students as secure and self-confident. The women teachers placed greater emphasis on character traits in students such as humility and modesty and more often stressed student negativism, hostility to the teacher, discipline problems, and getting into trouble in school as criteria of poor adjustment.

Meyer and Thompson (1956) investigated the relative frequency of women teachers' approval and disapproval of sixth-grade boys as contrasted with girls. Three classrooms of women teachers were observed. During the observation all teacher-initiated contacts of an approval or disapproval nature were recorded. Analysis of the observational data showed that in the three classrooms boys received more disapproval from their teachers than did girls. Both boys and girls in the classroom also nominated boys more frequently than girls as receiving disapproval from the teachers. A main conclusion of the study was that women teachers attempt to socialize boys by means of dominative counteraggressive behavior; that is, since boys are more aggressive in the first place and respond so to their teachers, the teachers tend to counteract or react with a higher degree of aggressiveness toward the boys. Meyer and Thompson made a reasonable proposal for handling the problem more adequately:

> We feel that the consistent trends in our findings imply that teachers' negative attitudes towards their male pupils arise from a lack of appreciation for the term "normal" male child. In our culture, aggressive outgoing behavior is as normal in the male as quiescent nonassertive behavior is in the female. The teacher who attempts to thwart this behavior by means of threats and punishment can only meet with frustration since the boy is confronted with a conflicting social code. A more reasonable plan to follow would seem to be one in which the excess energy and tensions of the male child could be discharged on some constructive activity. Planned physical education classes will do much to dissipate aggressive needs in a socially acceptable manner. Perhaps most important of all, however, is the knowledge that some degree of aggressive behavior is a normal part of development in both boys and girls and should be treated not as a personal threat to the teacher but as a sign of "normal" social and personality development [Meyer and Thompson, 1956, p. 393].

Labue (1954) found a sex difference between students who applied for entrance into a teacher education program and completed it and students who applied but dropped out before completing the requirements. For the women students, the only difference found between those who persisted and those who did not persist was in valuing service to society. Forty-two percent of those who finished the program indicated they wanted to teach because they could serve society, whereas only 22 percent of those who dropped out gave the same reason. The differences between those men who persisted and those who quit were in desire to work in the major field and in perceiving teaching as a steppingstone to another occupation, with the persisters being higher in both areas.

Perhaps the most important implication of sex differences for men and women teachers is that teachers should examine their own attitudes toward self and sex role, abilities related to the particular level of teaching, interests, and attitudes toward pupils of the same and opposite sex. Growing boys need some masculine males as models to imitate just as growing girls need feminine teachers. Women teachers generally appear to relate less well to boys in their classes than do male teachers to either boys or girls.

SOCIAL CLASS

Most teachers, and the schools generally, encourage the development of middle-class social attitudes and values. Many prospective teachers, however, originally come from homes of lower social-class background, and increasingly larger numbers are coming from homes where the father is engaged in a profession or business. Though prospective teachers are drawn from various social-class backgrounds, it is entirely possible that the interests, attitudes, and values which attract these students to teaching are much the same and that, regardless of social backgrounds of parents, teachers are as homogeneous in attitudes, values, and goals as are members of other professions such as medicine and law. Persons in education, in turn, receive relatively high social status in the community. Deeg and Paterson (1947) found that school superintendents and teachers were receiving as high status in 1947 as in 1925. In both these years, superintendents were rated fourth and elementary teachers eighth in a group of twenty-five occupations. Physicians, lawyers, and bankers were rated in social status higher than the superintendent of schools.

It is important for teachers to recognize their own attitudes and values and the attitudes and values of pupils as they come to school, in order not to discriminate inadvertently against a child whose attitudes and values might be very different. Hoehn (1954) found a positive correlation between achievements and social-class status of third-grade pupils. He also found that the teachers had more contacts with the higher-status and high-achieving pupils than with the lower-status and lower-achieving pupils. Though these teachers may not have discriminated against lower-status pupils, it is entirely possible that the children of lower social status who are not much interested in schoolwork, and whose parents are not, profit much less from attending school than do other children.

Accepting emotionally each child as he comes to school does not mean accepting antisocial conduct or permitting the highly withdrawn child to remain unattended in school. Regardless of the child's attitudes and values which he may have learned in the home, the teacher cannot permit fist fighting, cursing, stealing, vulgar language, destruction of property, and open rebellion against the rules and regulations needed to operate a school or classroom. The teacher can, although sometimes with difficulty, demonstrate affection and sympathy for a student and at the same time not permit him to violate generally accepted codes of conduct. If pupils of lower social class are going to profit from education, they must somehow internalize generally accepted attitudes and values and yet somehow not destroy themselves through violent conflicts with their parents, neighborhood groups, or the school. Research is not clear as to whether teachers from upper, middle, or lower social backgrounds can be most helpful to the many boys and girls of lower social class background. Apparently, the social background of the teacher is not nearly so important as are the present attitudes, the values, and the skills of the teacher. Teachers and the schools generally cannot, because of community pressures, abandon such middle-class principles as respect for the rights of others, for good care of property, for wise use of time, and for making progress; but they can attempt to understand the way of life followed in the homes from which all of the pupils enrolled in the school come.

SUMMARY

The abilities and personal characteristics of teachers are more stable than of pupils, especially through the twelfth grade. Cognitive and psychomotor abilities of teachers correlate lower with teaching success than do the same abilities of students correlate with their success on school learning tasks. In part this results because teachers are a selected group, whereas all pupils are required to attend school. Efficiency of pupil learning, however, is enhanced when guided by a teacher who is intelligent, well prepared in the subject matter, a high achiever while in college, and generally well educated.

The affective characteristics of teachers are being studied more intensively in recent years. High interest in the students and the subject matter, favorable attitudes toward the students and the subject matter, and a stable personality are associated with successful teaching. Age, sex, and social-class background of the teacher have not been demonstrated to affect efficiency of pupil learning markedly. However, the interactions among teachers and pupils of varying ages and among teachers and pupils from various social-class backgrounds have not been investigated fully.

QUESTIONS AND ANSWERS

1. (a) Why are the correlations low between achievement in college and subsequent success in teaching?
   (b) Why is the correlation higher between grades made in student teaching and subsequent teaching success than between IQ and teaching success?
2. Discuss the relationship between interests and teaching success.
3. (a) Why might teachers' and clinicians' attitudes toward behavior problems show higher congruence in 1950 than in 1930?
   (b) Why might marked differences still exist between teachers and clinicians?
4. Should elementary teachers' attitudes and values for children and education be different from those of high school teachers? Discuss your opinions on this matter fully.
5. With which problems should the study of educational psychology be most helpful to school personnel?
6. (a) Outline the effects of aging in the adult population generally.
   (b) Discuss Ryan's conclusions about age and teaching effectiveness.
   (c) Give your opinion as to whether all teachers should be permitted to teach up to age seventy.
7. (a) State and discuss the conclusions from the research dealing with differences between male and female teachers.
   (b) At which school level are boys provided least satisfactory models in their teachers? What might be done to improve this situation?
8. (a) In which social class do you place your parents? Yourself?
   (b) Describe the type of community in which you most prefer to work. Least prefer to work.
   (c) Identify classroom behaviors of children which you find difficult to tolerate. Easy to praise or reward.

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Chapter 5 Classroom Interactions and Efficient Learning

Characteristics of pupils and of teachers were examined in the previous two chapters. Cognitive, psychomotor, and affective characteristics of the learner and of the teacher were shown to set some limits on the efficiency of learning. The more immediate interactions between the teacher and the pupils and among the pupils are also related to learning efficiency. It is in the classroom or other behavioral setting that the characteristics of pupils and teachers are brought together. In these settings interactions take place and desired behavioral changes can occur through efficient teaching–learning processes.

We now turn to a more complete discussion of classroom interactions and efficiency of learning, developed as follows: (1) the classroom as a behavior setting; (2) communication and teacher–pupil interactions; (3) general teacher behaviors; (4) leadership behaviors of the teacher; (5) the teacher as a helpful person; (6) pupil–pupil interactions.

THE CLASSROOM AS A BEHAVIOR SETTING

As shown in Chapter 1, the classroom setting is comprised of pupils with characteristics, a teacher or teachers with characteristics, the physical characteristics of the room, the characteristics of the group, behaviors of the teachers and pupils. Behaviors include not only overt physical activities such as talking and doing but also such cognitive processes as perceiving, generalizing, thinking, and problem-solving. The classroom and other school facilities are places in which the teacher is to assist in bringing about desirable changes in pupil behaviors. Through the teacher's interacting with the pupils and their interacting with one another, interests, motives, social skills, and many outcomes in the cognitive and the psychomotor domains are acquired more efficiently than they would be if these interactions did not occur. Four facets of classroom interaction are now treated before the more detailed consideration of communication in the classroom is discussed.

The Stimulus Nature of Pupils and Teachers

The most stimulating aspect of the environment for a person is himself. The second most stimulating factor is usually the other individuals in the more immediate environment. In most group situations there is continuous stimulation among members.

Pupils in a classroom group vary in many respects. Some speak freely, loudly, and often; others speak scarcely at all. Some are highly intelligent and learn easily; others are of low intelligence and learn with difficulty. These pupils stimulate teacher behaviors. The observant teacher wonders why many arrive at school with soiled clothing and uncombed hair. And why does Johnny have such a strong need for attention? Why is he scuffling with others, talking loudly, and making himself a general nuisance? How is it that Bill already knows everything that other pupils are now struggling with? The university professor wants to know why several students enrolled in his course when they appear to be so uninterested and not inclined to take any initiative to learn. He also considers what might be the top limits of learning of several of the highly intelligent students. A well-dressed, well-mannered group of high-achieving pupils produces different teacher responses and feelings than does a group of mentally retarded, crippled, or emotionally disturbed children. The characteristics and behaviors of pupils stimulate most teachers to respond to them as human beings, not simply as a collection of objects to be molded or changed.

The teacher, too, serves as a stimulus for the learners. They are aware not only of the teacher's personal appearance but also of his speech and actions. If the teacher behaves in such way as to be strongly admired by a pupil, the pupil will attempt to pattern his behavior after the teacher. Similarly, if the teacher attempts to meet the minor aggressive reactions of a pupil with aggressive acts against him, the pupil's behavior in turn is likely to become even more aggressive. Students attending the same school for a year or two expect to behave somewhat differently in various classes because of the generally established reputation of the teacher. College students, for example, enroll in one class with the expectation of sitting quietly and taking notes from the lecturer throughout the entire semester, except for examination periods. They enroll in another class expecting the instructor to help them identify significant problems and to provide the needed guidance for them to find some reasonable solutions to the problems through laboratory work, library study, discussions, and the like. Since the teacher has the responsibility for instruction in the classroom and since there are usually many pupils and one teacher, the teacher's total stimulus effect on the pupils is generally higher than that of an individual pupil on the teacher.

Social–Emotional Need Satisfactions

To live comfortably with themselves, most human beings need to give and receive affection, to receive approval from age-mates and others, to maintain self-respect and a feeling of well-being toward themselves, and to achieve success. Most of us satisfy these needs in a social setting through interacting and living with one another. University and high school students rely somewhat less than children in the elementary grades upon immediate contacts in the classroom for satisfaction of these needs. However, older students generally want respect, approval, and sometimes affection from their classmates. If given the opportunity, they attempt to seek emotional satisfactions in the classroom. In the elementary grades and high school, being liked by one or more members of the class is the strongest need many individuals experience. Pupils rely heavily on their associations in school as a means of satisfying emotional needs and building social skills.

The teacher who is happily committed to a lifetime career in teaching also relies upon the interactions with members of the class or classes for satisfaction of many of his social–emotional needs. To attain self-realization and to maintain a fairly well-integrated personality, the teacher must find satisfactions rather than dissatisfactions in the many daily contacts with students. Though quite impersonal and not highly concerned about students' likes or dislikes, the professional teacher must be assured that the students are learning under his direction. A person committed to a lifetime career in teaching cannot achieve any reasonable measure of self-realization when he knows both that he is disliked by the students and that they are not learning as well as they might with a different teacher.

Immediate Reinforcement and Confirmation of Behaviors

During a single class period, many immediate behaviors of the pupils can be reinforced or corrected, confirmed or denied. The behaviors can be oral, as in discussions and question-and-answer periods; written, as in mathematics or social studies; or physical actions, as in music, typing, and many others. For example, members of smaller groups within a class discuss what each person is going to do to complete a project. As the five or six members of each group discuss the project, large amounts of information can be exchanged. Also, if all the members discuss freely, many agreements and disagreements are encountered in planning activities and assigning responsibilities. When the discussions of the project start, Susan may immediately outline what each other member is to do. The others being assigned duties respond negatively. Thus, Susan learns immediately that her proposal is unacceptable–she finds her behavior unconfirmed or even denied. Joyce now proposes that each member suggest what he would like to do. The others accept this proposition. Joyce's behavior is confirmed, and if Susan can profit from experience, her behavior is corrected. Some social skills are developed in this way.

Why does short question-and-answer recitation work? It is in part because students may prepare to answer but also in part because the pupil's answers are immediately reinforced by the teacher or classmates or corrected by the teacher and classmates. Board work, too, can sometimes be effective because it gives the teacher the opportunity to see the immediate results of a number of students' work, to reinforce whatever is correct, and to help them identify and overcome errors or difficulties.

How does a teacher judge the effectiveness of instructional materials or procedures? For the most part this judging is not done through administering tests at the end of a week, month, or semester. A test given a month or two after pupil learning supposedly has occurred is too late for the teacher to ascertain the extent to which the more immediate materials and procedures were successful. If one gives oral or written instructions for making an outline map, one should not wait a day or week to ascertain whether the pupils learned from the instruction. One needs to observe immediately whether the pupils are carrying out the instructions properly.

Successful teachers are generally observant of the behaviors of students. They try to help the students do well and are guided in this effort by responding to the student's questions and other reactions. In turn, depending on how well the students respond, they continue some successful procedures but change them if any assignment, instructional activity, or teaching procedure appears not to secure desired responses. The teacher thus confirms or corrects methods largely on the basis of the student's more immediate responses.

COMMUNICATION AND TEACHER–PUPIL INTERACTIONS

What means are available for expressing ideas and feelings to others? How are communications perceived so that change in behavior can occur? Consider now the principal means the teacher has for influencing pupils and the means pupils have for perceiving and acting upon the teacher's communications. Particular attention is given to communicating with symbols in oral and written form.

The Teacher's Means of Communicating

The teacher's most direct means of communicating to pupils is through speaking or other forms of oral expression; writing on paper, the chalkboard, or other material; gesturing and other movements; and actual physical contact with the pupil. Most of these are used in a good classroom demonstration. In demonstrating the solution of a problem, the teacher may write portions or all of it on the chalkboard, speak about it, and gesture while speaking and writing. The music teacher also may sing the song first, with appropriate gestures and movements to convey the mood as well as the words and melody. Similarly, speaking, writing, and gesturing or physical movements are used in most instructional procedures, including group discussion, giving an assignment, dividing the class into smaller groups for work activities, giving instructions for the field trip, and so on. Actual physical contact as a means of communicating is shown by the teacher's grasping and guiding the arm of the child who is learning handwriting or grasping and placing the arm of the beginning typist in proper position at the typewriter. Some teachers pinch, pull hair, or slap children to communicate their feelings. Recall your instruction during your high school years or most recent college classes. How did the teacher influence your behavior by means other than the four just treated?

Less directly, a teacher communicates through the use of instructional materials and equipment and through manipulation of students, as by placing them in a circle for discussion and at tables for small group activities. The books made available by the teacher, the opportunities for listening to radio and watching television, and the use of such devices as "teaching machines" and tape recorders also are indirect means of teacher communication. To the extent that certain of these are made available, the teacher can communicate through them without speaking, writing, or doing anything. In most situations, of course, efficient use of any such material or device is dependent on what and how the teacher communicates to the learners directly in the form of assignments, discussions, and the like. To manipulate the class as in seating arrangement, the teacher, orally or in written form, gives instructions for seating. However, besides simply telling a misbehaving child to move from the rear to the front of the room, the teacher communicates feelings about the child's behaviors. Similarly, after four high school students who are good friends have been seated alphabetically and thus apart from each other, the teacher may subsequently assign them seats in close proximity, thus communicating to them the idea that good friends should have the opportunity of being or working together.

Even less directly, the teacher communicates through personal appearance and through appearance of the room. Without words, the personal appearance of the teacher communicates some ideas and feelings. A sloppily dressed and poorly groomed person gives the impression of having a low degree of self-respect or a value system different from that of most teachers. A female's wearing the same apparel day after day and week after week gives high school students a feeling of monotony and dreariness. Similarly, a classroom in which there is never a change of plants, bulletin board, and other decorative and instructional materials may communicate feelings of disinterest and boredom.

Some of the more direct and indirect means of communication are also employed by the pupils to communicate to the teacher. Further, the perceiving and acting upon communications, to be discussed below, could also be applied to the teacher's perceptions of pupils' communications.

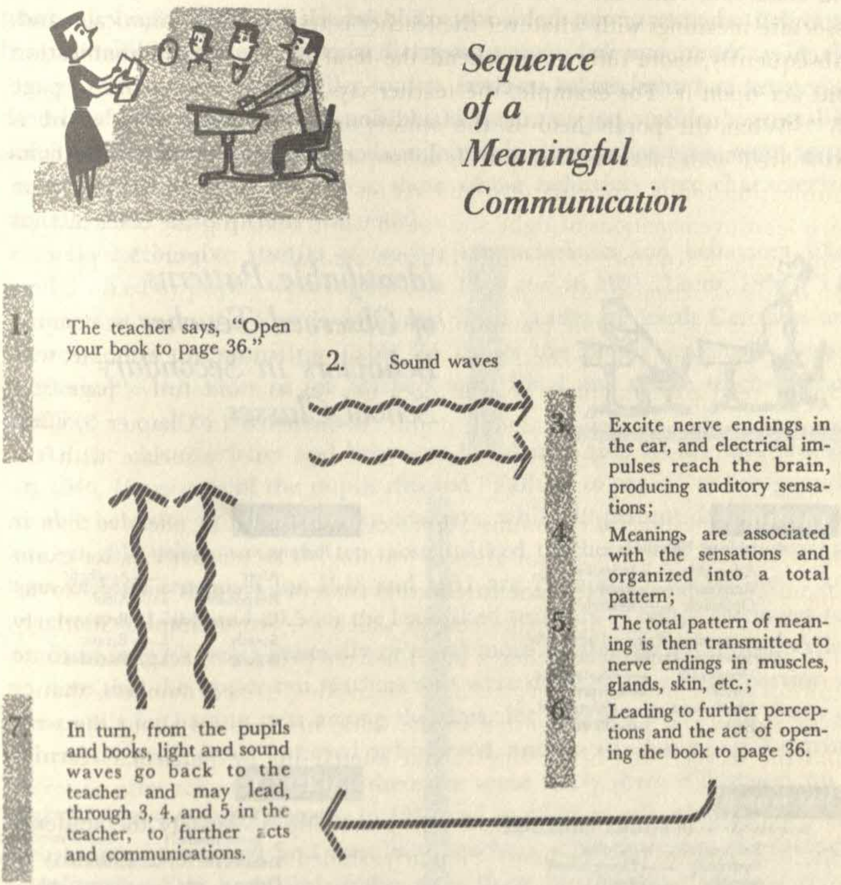
Learners' Perceiving and Acting upon Communications

In Chapter 1, perception was described as sensing something in the outer or inner environments of the individual, being aware of the sensory experience and associating it with meaning, and patterning sensory experiences and meanings into some form of total understanding. The learners in the classroom sense the teacher's voice or written communications, try to associate meanings with whatever the teacher is trying to communicate, and, subsequently, more fully comprehend the total pattern of communication and act upon it. For example, the teacher says, "Open your books to page 36." What the pupils hear is the sensory impression. If every word is associated with meaning, the pupils subsequently organize the entire communication into a larger pattern and act on it. The subsequent actions in turn lead to emanations of light and sound waves reaching the teacher, thus completing a sequence of meaningful communication. Figure 5.1 presents the sequence schematically.

When might a simple communication from the teacher not be comprehended? It would not be comprehended by an individual, for example, who cannot read page numbers or who does not understand fully "page 36." Similarly, other differences among pupils, as discussed in Chapter 3, affect both how well they perceive and the meanings they associate with the perceptions.

More difficulties of communication seem to arise in the affective than in the cognitive and psychomotor areas of learning. The teacher can, for example, more easily make clear the intellectual content of words such as "love," "grief," and "elation" than the feelings which the words imply. Similarly, it is easier to ascertain whether a pupil has the previous background to acquire a mathematical process, such as subtracting mixed numbers, than it is to ascertain if he is interested in the work, his feelings about the work and the teacher, and his feelings about himself in the particular learning situation.

The teacher often has difficulty in perceiving accurately the students' interests, motives, and feelings. Similarly, students often have difficulty in perceiving the teacher's interests, motives, and feelings. This comes about because each individual perceives self and situations from his own personal frame of reference. Each learner brings to school all of his previous experiences as well as his estimates of the present situation and his ideas and feelings about the future. So does the teacher. At times these individual frames of reference are so far apart that the teacher, after best effort, says, "I simply do not understand this child." And the pupil thinks or says, "What is she trying to get at? I don't understand why she is angry." Referring again to Figure 5.1, we see that there is a possibility for understanding one another. There can be continuous feedback and correction between teacher and pupils, particularly of the content or factual meanings. The best possibility for mutual understanding of feelings and other affective components of classroom interactions is through establishing a secure environment in which people feel relatively free to express their emotions. Providing a secure environment is mainly the responsibility of the teacher and is closely associated with general teacher behaviors and the more specific leadership behaviors.



Sequence of a Meaningful Communication

1. The teacher says, "Open your book to page 36."

2. Sound waves

3. Excite nerve endings in the ear, and electrical impulses reach the brain, producing auditory sensations;

4. Meanings are associated with the sensations and organized into a total pattern;

5. The total pattern of meaning is then transmitted to nerve endings in muscles, glands, skin, etc.;

6. Leading to further perceptions and the act of opening the book to page 36.

7. In turn, from the pupils and books, light and sound waves go back to the teacher and may lead, through 3, 4, and 5 in the teacher, to further acts and communications.

FIGURE 5.1.

GENERAL TEACHER BEHAVIORS

A surprisingly large number of persons still feel that anyone can teach and that learners should adapt readily to any form of teacher behavior. In part, this misconception occurs because few careful studies of teacher behaviors have been completed. Examine now results of three of the better studies.

Can trained observers reliably identify differences in the behaviors of high school teachers (Ryans and Wandt, 1952)? The high school classes of 115 men and 134 women teachers were observed. In these classes the behaviors of the pupils and of the teachers were observed and rated. The ratings were subsequently treated by factor analysis. As shown in Figure 5.2, the factors and the favorable expressive words for each were: A1–Sociable, A2–Understanding, Fair, B–Businesslike, C1–Pupil Participation, C2–Controlled Pupil Activity, D–Reactive, E–Original, Tolerant, F–Good-appearing. At this early stage in the study Ryans and Wandt were attempting to establish whether or not behaviors could be reliably differentiated among teachers. No attempt was made to ascertain whether the factors differentiated successful and unsuccessful teachers.

Subsequently, a large number of additional studies were completed both with elementary and secondary school teachers in a number of subject fields.

Identifiable Patterns of Observed Teacher Behaviors in Secondary School Classes

FACTOR A

1. Sociable vs. Unsociable
   - Adaptable ←→ Inflexible
   - Responsive ←→ Aloof
   - Optimistic ←→ Pessimistic
2. Understanding, Fair vs. Unfriendly, Domineering, Partial
   - Democratic ←→ Autocratic
   - Kindly ←→ Harsh
   - Understanding ←→ Restricted
   - Fair ←→ Partial

FACTOR B

Business-like vs. Disorganized, Irresponsible

Responsible ←→ Evading
Systematic ←→ Disorganized
Steady ←→ Erratic
Broad ←→ Narrow
Fair ←→ Partial

FACTOR C

1. Pupil Participation vs. Pupil Nonparticipation
   - Initiating ←→ Dependent
   - Alert ←→ Apathetic
   - Confident ←→ Uncertain
   - Stimulating ←→ Dull
   - Responsive ←→ Aloof
2. Controlled Pupil Activity vs. Uncontrolled Pupil Activity Responsible — Obstructive

FACTOR D

Reactive vs. Composed

Alert ←→ Apathetic
Responsive ←→ Aloof
Understanding ←→ Restricted
Steady ←→ Erratic
Poised ←→ Excitable

FACTOR E

Original, Tolerant vs. Stereotyped, Intolerant
(Open-minded) (Closed-minded)

Democratic ←→ Autocratic
Original ←→ Stereotyped
Adaptable ←→ Inflexible
Broad ←→ Narrow
Stimulating ←→ Dull

FACTOR F

Good-appearing vs. Poor-appearing

Pleasant ←→ Monotonous (Voice)
Attractive ←→ Unimpressive
Poised ←→ Excitable
Articulate ←→ Inarticulate

FIGURE 5.2. *(Adapted from Ryans and Wandt, 1952, p. 585.)*

In one study over 2000 teachers in various communities in the United States served as subjects (Ryans, 1959). At this point three main patterns, not separate factors, of teachers' classroom behavior were identified as being of special significance. One pattern deals with behaviors indicative of being friendly and understanding versus being aloof, egocentric, and restricted.

A second pattern is being responsible, businesslike, and systematic versus evading, unplanned, and slipshod. The third behavior pattern is that of being stimulating, imaginative, and surgent versus dull and routine. In this large study, as in other smaller studies, teachers whose behaviors were characterized by friendliness and understanding; being responsible, businesslike, and systematic; and being stimulating, imaginative, and surgent were found to be more successful than were those whose behaviors were characterized by the polar descriptions just cited.

Comprehensive studies of teacher characteristics and behaviors liked and disliked by pupils were reported in 1946 and in 1951 (Leeds, 1954). The teachers were in the fourth, fifth, and sixth grades in South Carolina and Pennsylvania communities. Table 5-1 shows the pupils' responses toward undesirable behaviors of ten teachers most liked and of ten teachers most disliked in each of the studies.

All the characteristics and behaviors listed in Table 5.1 are undesirable. In 1946, 10 percent of the pupils checked "Failure to praise" as being undesirable behavior in the upper ten teachers, while 49 percent checked this as undesirable behavior in the ten most disliked teachers. The mean percentages of total responses for 1946 and 1951 are 7.3 and 5.7 for the best-liked teachers, and 50.5 and 29.5 for the least-liked teachers. Though the lower ten teachers in both years generally received more disapproval, it is interesting to note that the upper ten teachers also were disliked by a large portion of the pupils for having pets among the class, for scolding a pupil in front of others, for being easily annoyed or bothered, and for detaining pupils during recess or after school. Though there are some fairly sharp differences on a few items between the teachers in 1951 and in 1946, pupils rated undesirable behaviors of best-liked and least-liked teachers with surprising consistency. Further, the 1946 and 1951 studies were done in different states.

From Table 5.1 it is seen that the behavior traits which differentiated most noticeably between the better and poorer teachers were: scolding pupils, usually cross, often bossy, talking too much, fussing at the pupils, becoming angry at pupil's failure to understand, and often becoming angry with pupils. The reasons the pupils gave for liking their teacher, not shown in Table 5.1, are as revealing as the dislikes. As you read, check each one that you can recall as characteristic of one of your best teachers.

Reasons for Liking Teacher:

"Because she is always friendly to the pupils."

"She is very patient and kind."

"I like this teacher because she is kind and not a boss."

"I like her because she is interested in my hobby which is building airplanes, boats, and other models."

"She considers herself one of us."

"Because she is helpful. I can take problems to her. She understands. She is pretty (that helps out a lot.)"

TABLE 5.1. ***Frequency of Pupil Reaction Toward Undesirable Behavior of the Ten Teachers Taken from Each End of the Distribution of Pupils' Ratings (1946 and 1951 Studies)***

Item Number	Undesirable Teacher Behavior	Percentage of Pupil Reaction to Upper Ten Teachers 1946 (N:281)	Percentage of Pupil Reaction to Upper Ten Teachers 1951 (N:257)	Percentage of Pupil Reaction to Lower Ten Teachers 1946 (N:265)	Percentage of Pupil Reaction to Lower Ten Teachers 1951 (N:261)
3	Failure to praise	10	5	49	15
4	Scolds pupils a lot	4	7	71	50
5	Usually cross	3	4	59	20
6	Doesn't explain school work	0	2	19	6
7	Doesn't speak to pupil on street	0	1	20	6
8	Unable to keep order	5	7	30	48
9	Does not make school work interesting	1	1	39	21
10	Often "bossy"	2	4	58	32
11	Difficult to approach with problems	5	6	56	26
12	Forces ideas on pupils	12	8	44	24
13	Not usually kind to pupil	2	0	37	10
14	Does not keep promises	2	0	25	19
15	Does not participate in children's games	9	17	64	64
16	Thinks she is always right and pupil wrong	7	2	51	31
17	Has "pets" among the children	27	16	54	57
18	Scolds a pupil in front of other pupils	44	23	91	80
19	Difficult to please	7	4	64	33
20	Talks too much	5	3	63	40
21	Easily annoyed or bothered	17	11	70	61
22	Unfair with pupils	3	2	39	18
23	Always "fussing at" the pupils	6	2	58	31
24	Failure to acknowledge pupil's hand	5	4	48	34
25	Detention during recess or after school	16	30	69	87
26	Makes fun of pupils	6	3	38	15
27	Disliked by most pupils	2	1	68	30
28	Doesn't laugh with pupils at amusing incidents	11	10	44	20
29	Unfair in grading	3	2	33	9
30	Talks too loudly	1	1	43	21
31	Does not give everyone a chance to recite	2	5	40	29
32	Failure to explain school work	1	0	28	9
33	Becomes angry at pupil's failure to understand	5	3	59	33
34	Unwilling to help with school work	2	2	38	15
35	Doesn't seem to like children	1	0	42	16
36	Punishes whole class for 1 or 2 offenders	12	8	71	41
37	Scolds pupils for mistakes	4	2	55	22
38	Does not give opportunity for questions	0	3	34	21
39	Lowers grades for helping others	19	20	57	20
40	Will not permit making up work failed	13	9	54	18
41	Often becomes angry with pupils	7	4	74	61
42	Pupil afraid to ask for help	6	4	42	20
43	Assigns "lots" of homework	5	8	54	55
44	Punishes in front of other pupils	20	14	86	61
45	Unwilling to give extra help	1	2	31	10
46	Does not see things as children do	3	5	52	37
47	Uninterested in pupil's activities outside of school	33	9	63	39
48	Does not explain lessons clearly	1	1	31	11
49	Disliked by individual pupil	1	0	53	28
50	Disliked by other pupils	1	1	58	20
	Total average per item	7.3	5.7	50.5	29.5

SOURCE: *Leeds, 1954, pp. 81, 82.*

"Because when I came to this school she was kind to me."

"Because when I ask her questions she gives me a chance to tell her."

"I like my teacher because she is interested in children."

"She tries to be very understanding. I think she is grand to put up with us."

"She is kind and not like most other teachers."

"Because she keeps her promises and takes us on trips and lets us ask questions without getting mad at us."

"She is kind and helpful and explains things carefully and listens to what you say."

"I like this teacher because she is fair and I feel free to ask her anything."

"She isn't cranky. She doesn't get angry when you don't get everything right."

"Because she'll stop and help anybody who needs help when she has important work to do."

"Because she is helpful and understanding in my work. And she is like a mother to all the children."

"Because she lets you laugh when something is funny and she has fun with the children."

"I like this teacher because she's easy to get along with and I'm always at ease when I'm in her room."

"I like this teacher because she does not get angry. She does not embarrass us in front of the class."

"I like her for she is very nice, talks low, not too low, and she explains your lessons clearly."

"Because she likes all the children and not one or two."

"She goes skating like boys and girls and likes basketball and laughs when we do."

"Because she is humorous and laughs with the class and it makes school more fun" [Leeds, 1954, p. 34].[1]

The above information does not tell us whether pupils learned the usual subject matter more or less efficiently under the best- or least-liked teachers. We infer, however, that, if a teacher desires her pupils to like her, then certain behaviors are appropriate and others are inappropriate. Further, we know that the teacher as a model for children is important; and it is established beyond doubt that pupils of this age as well as human beings of any age do not imitate the behaviors of a person whom they dislike.

Do all pupils respond in the same manner to teacher behaviors? Thompson and Hunnicutt (1944) investigated the effects of the teachers' use of praise or blame on the subsequent achievements of withdrawing or introverted pupils and of outgoing or extroverted pupils. Six short tests over a short time period were administered to the pupils. Figure 5.3 shows the results. On Tests 1, 2, and 3 before much praise or blame was given, the differences among the groups were very small. However, on Tests 4, 5, and 6 moderate differences appeared. At the end of the study, the extroverts who were blamed scored highest, and the introverts who were praised were nearly as high; but the extroverts who were praised and the introverts who were blamed were considerably lower. Though not shown, either praise or blame was more effective than no external incentive in increasing the work output, and praise and blame were equally effective in motivating the pupils if the introverts and extroverts were not differentiated. In this study, each testing period was for only thirty seconds. Also, test items, involving cancellation, could be performed very quickly. Further, the praising consisted of the teacher's placing a "G" for good on the test paper after it was handed in, and the blaming consisted of placing a "P" for poor on a test paper. Subsequently and privately when returning the papers to each child, the teacher said that the "P" stood for poor work and the "G" for good work. One should not generalize from this study to the use of other forms of praise and blame or to often repeated use of the above forms over an extended period of time.

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[1] Reprinted from the 1954 issue of *Education* by permission of the publishers, The Bobbs-Merrill Company, Inc., Indianapolis, Ind.

Effects of Praise and Blame on Extroverts and Introverts

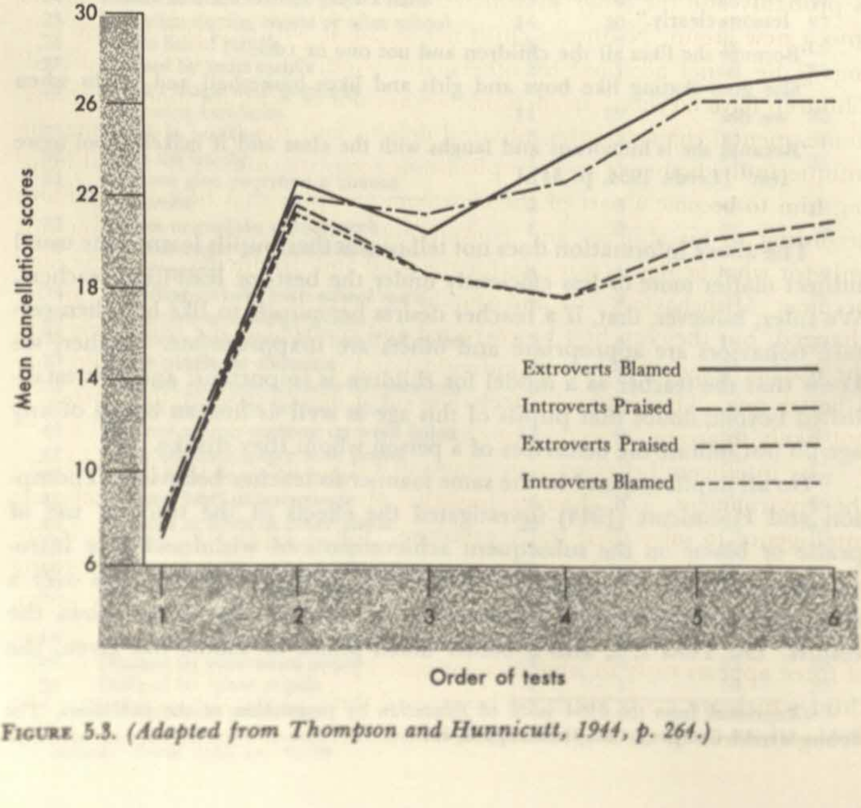


FIGURE 5.3. *(Adapted from Thompson and Hunnicutt, 1944, p. 264.)*

LEADERSHIP BEHAVIORS OF THE TEACHER

What kind of leader should the teacher try to be? In certain situations a teacher must be highly directive and forceful and in other situations permissive. Thus, the form of leadership must be related to such factors as the age of the learners, the number in the group, the activity being engaged in, and the goals sought by the teacher. Though directive in some situations and permissive in others, the teacher's choice of leadership should be guided by the following principles, deemed necessary for the maintenance and improvement of group living:

1. Respect the unique individuality of every other person.
2. Use intelligence rather than force in solving problems.
3. Contribute to the welfare of the group.
4. Accept responsibility for your actions.

When adults respect the unique individuality of children at home or in school, each child feels that he belongs in the group and that he is wanted and worthwhile. He participates in the activities of the group and feels that he has a definite place in the group—that he has status. Finally, he feels secure in the group. These feelings are interdependent; no one is more important than any other. However, the order in which they are presented is probably also the order in which a child experiences them as he moves into a new group. Neither a child nor an adult will experience these feelings if he is not accepted by others, if his individuality is not respected. Children have no choice in such matters as color of skin, location of parents' home, mental characteristics, physical defects, and the like. Respecting the unique individuality of each pupil means accepting him as he is and helping him to become a part of the classroom group so that he can contribute according to his abilities and background. The teacher accepts him not only for what he now is but also for the good and productive citizen he may become. Misbehaviors can and should be corrected and attitudes can be changed; but they can best be corrected and changed if the child feels that the teacher respects him as an individual and is trying to help him become a better one. The child who feels unwanted or rejected by the teacher is not likely to accept correction or change his attitudes.

By intelligent behavior man adapts to a changing environment, changes the environment, and changes himself. Most individuals have sufficient intelligence to solve their daily problems. But it takes considerable learning to take good care of own and others' property, to play football according to the rules, to behave in a socially approved manner at the junior prom, or to study independently at the library as a college student. And the use of force appears early in human relations. Parents set requirements for the child which are easily enforced because of their physical superiority. The strong children in the neighborhood set the rules of the game for the weaker who must follow or quit. The use of force is strongly ingrained in the habitual behaviors of some students and, perhaps, in some teachers also. If, however, the goal of instruction is to help learners eventually govern themselves by intelligence rather than fists, verbal tirades, and lethal weapons, opportunities must be available in the classroom to practice the use of intelligence. This is, of course, impossible if a teacher always employs force when conflicts arise between the pupils and himself.

Cooperating on a local, state, and national level is generally accepted in politics after the elections are over. At the social level, people organize into labor unions, professional organizations, businessmen's clubs, service groups, and the like. College fraternities and sororities exist because college students want to band together. All such organizations indicate people's willingness to cooperate—to contribute time, money, and loyalty for the welfare of the group and themselves. But competition among individuals and groups is also widespread in our society and can lead to higher motivation and productivity among individuals and among groups when reasonably controlled. However, we seem not to be able to control competition well. Witness the increasing breakup of families in divorce, the human suffering which ensues from competition between management and labor, the whole history of Western civilization characterized by international and civil wars, and the continued racial problems throughout the world. Many of these undesirable outcomes are quite directly the results of intense competition for the things of life, or at least are indicative of the unwillingness or lack of ability of people to cooperate for the mutual welfare. Cooperative behaviors can be learned in the school and classroom. If so, teachers must give pupils opportunity to identify group goals, plan activities, develop communication skills, apportion responsibilities for work, and the like.

Freedom of action means that the individual acts in accordance with his own intelligence in making choices, but it also suggests that the individual must assume responsibility for his actions in the social groups to which he belongs. The teacher who wishes to encourage this ideal must give students some opportunity to make choices, to evaluate the choices before acting, and to assume the responsibility for their actions. The last named implies bearing the consequences of actions not only upon self but also upon others whom the individual's actions might affect. These behaviors are not learned in school if the teachers always tell the pupils what to do, when, and how they should do it. The leadership behaviors of the teachers are related not only to broad democratic ideals as these but also to outcomes of learning in the usual subject-matter fields.

The effects of various forms of leadership have been reasonably well identified through research in various group settings. Part of the research has been carefully controlled; other research is more descriptive of what was observed in usual uncontrolled group situations. Some results and procedures of the more comprehensive studies are now presented.

Authoritarian, Democratic, and Laissez-Faire Leadership

Lewin and his associates, Lippitt and White, carried on a series of experiments to ascertain the effects of various forms of leadership upon the individual and group behavior of eleven-year-old boys in a club situation. The report of their procedures and results are given in many articles and films. The best summary of all the results and procedures was reported by Lippitt and White (1958). Three forms of leadership were experimentally arranged—authoritarian, democratic, and laissez-faire—and two atmospheres were found under autocratic leadership, designated as aggressive autocracy and apathetic autocracy. The situations were so arranged that the groups of boys experienced each type of leadership, making possible comparison of the leadership effects on the same boys. Now follow descriptions of the three leadership roles:

> *Plan for authoritarian leadership role.* Practically all policies as regards club activities and procedures should be determined by the leader. The techniques and activity steps should be communicated by the authority, one unit at a time, so that future steps are in the dark to a large degree. The adult should take considerable responsibility for assigning the activity tasks and companions of each group member. The dominator should keep his standards of praise and criticism to himself in evaluating individual and group activities. He should also remain fairly aloof from active group participation except in demonstrating.
>
> *Plan for the democratic leadership role.* Wherever possible, policies should be a matter of group decision and discussion with active encouragement and assistance by the adult leader. The leader should attempt to see that activity perspective emerges during the discussion period with the general steps to the group goal becoming clarified. Wherever technical advice is needed, the leader should try to suggest two or more alternative procedures from which choice can be made by the group members. Everyone should be free to work with whomever he chooses, and the divisions of responsibility should be left up to the group. The leader should attempt to communicate in an objective, fact-minded way the bases for his praise and criticism of individual and group activities. He should try to be a regular group member in spirit but not do much of the work (so that comparisons of group productivity can be made between the groups).
>
> *Plan for laissez-faire leadership role.* In this situation, the adult should play a rather passive role in social participation and leave complete freedom for group or individual decisions in relation to activity and group procedure. The leader should make clear the various materials which are available and be sure it is understood that he will supply information and help when asked. He should do a minimum of taking the initiative in making suggestions. He should make no attempt to evaluate negatively or positively the behavior or productions of the individuals or the group as a group, although he should be friendly rather than "standoffish" at all times [Lippitt and White, 1958, p. 498].

Figure 5.4 shows the behaviors of the leaders as actually carried out in the club situation. The authoritarian leader gave many more orders, disrupting commands, and nonconstructive criticisms. Guiding suggestions, extending knowledge, and stimulating self-guidance were much less frequent under authoritarian than under democratic and laissez-faire leadership.

Praise and approval were engaged in most by the authoritarian leader, being jovial and self-confident and matter of fact most by the democratic leader. Extending knowledge was the only behavior engaged in most by the laissez-faire leader. Thus with clearly planned procedures for producing differences in the leader behaviors, there were marked differences but also some overlapping of behaviors among the leaders.

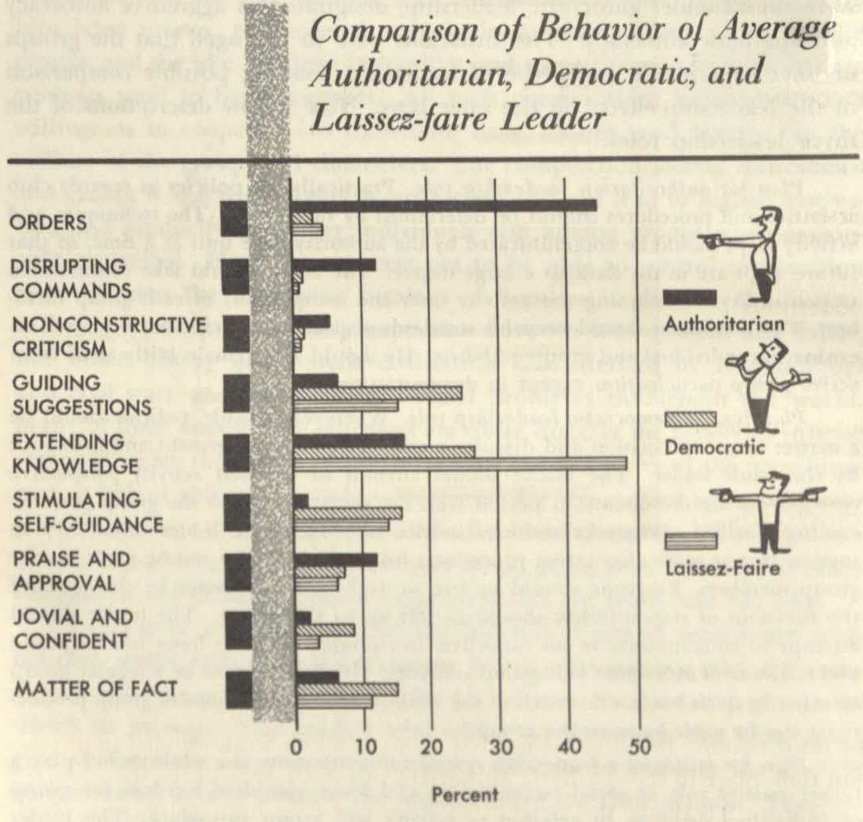
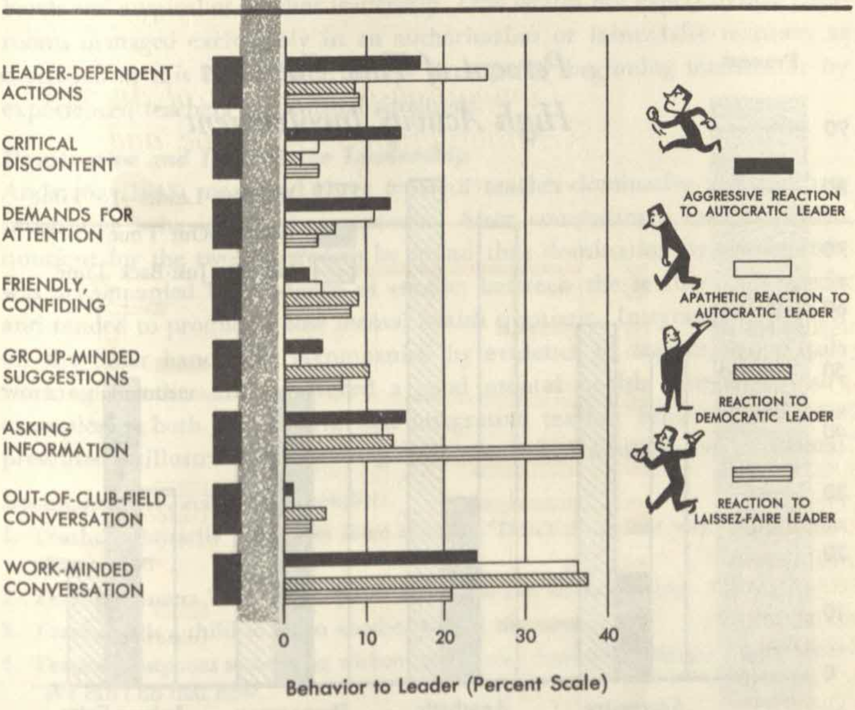


FIGURE 5.4. *(Adapted from Lippitt and White, 1958, p. 499.)*

Figure 5.5 gives the four patterns of reactions of the boys' groups to the three different styles of leadership. The boys' dependent actions upon the leader were much higher under authoritarian leadership than democratic or laissez-faire; critical discontent and demands for attention were also higher under authoritarian leadership. Friendly, confiding behaviors and group-minded suggestions were highest with democratic leadership, as were out-of-club-field conversations and work-minded conversations. The asking of information was highest under laissez-faire leadership; 37 percent of all the boys' behaviors toward the laissez-faire leader consisted of asking



Four Patterns of Group Reaction to the Three Different Types of Leadership

FIGURE 5.5. *(Adapted from Lippitt and White, 1958, p. 502.)*

for information. It is interesting that about as much work-minded conversation took place in the apathetic authoritarian situation as in the democratic.

Figure 5.6 shows the percent of time spent in high activity involvement. In aggressive autocracy, for example, the boys were highly active for about 53 percent of the time when the leader was present, about 17 percent of the time when the leader left the group; this figure moved up to nearly 60 percent immediately when the aggressive autocratic leader returned. The ratios are about the same in apathetic autocracy; however, the percent of time spent in high activity is much higher. Under democratic leadership work activity was about 50 percent when the leader was present; however, it did not drop off much when the leader left, and when he came back, it did not immediately pick up. With laissez-faire leadership the percent of time in high activity involvement by the boys was lowest among the various forms of leadership when the leader was present. However, it was also the highest when the leader was out. Thus, when the adult leader left, other leaders from within the boys' group emerged to take over activities, and as a group they were sufficiently interested in the activity to go ahead on their own. It is especially significant that under autocratic leadership, activity was much lower when the leader was out, but under democratic and laissez-faire leadership high activity involvement of the boys continued even though the adult leader left. With autocratic leadership, the boys did not know how to go ahead on their own and apparently did not want to go ahead.

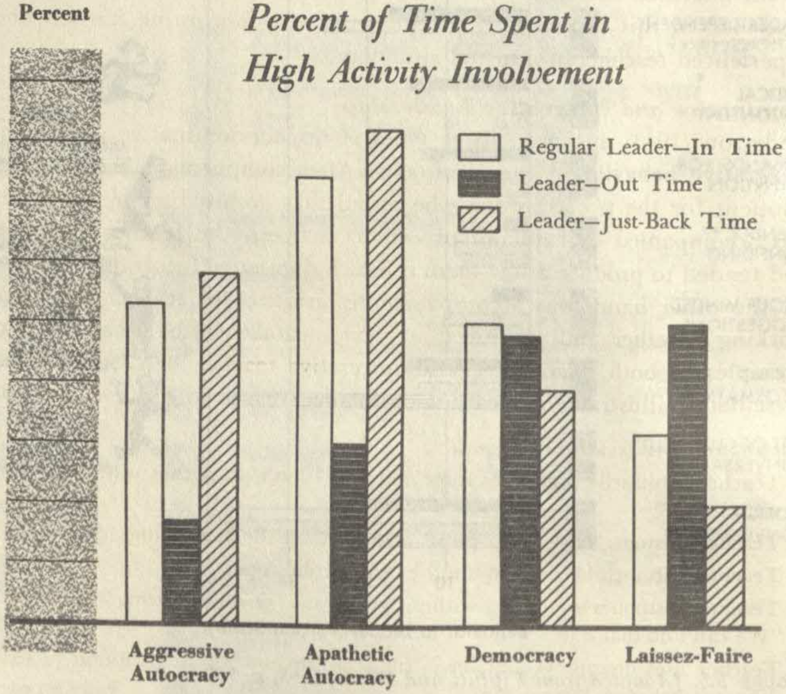


FIGURE 5.6. *(Adapted from Lippitt and White, 1958, p. 503.)*

Some of the more important conclusions reached by Lippitt and White other than those which may be inferred from the previous paragraphs are as follows:

> The adult-leader role was found to be a very strong determiner of the pattern of social interaction and emotional development of the group. Four clear-cut types of social atmosphere emerged, in spite of great member differences in social expectation and reaction tendency due to previous adult-leader (parent, teacher) relationships.
>
> It was clear that previous group history (i.e., preceding social climates) had an important effect in determining the social perception of leader behavior and reac-

tion to it by club members. A club which had passively accepted an authoritarian leader in the beginning of its club history, for example, was much more frustrated and resistive to a second authoritarian leader after it had experienced a democratic leader than a club without such a history. There seems to be some suggestive implications here for educational practice [Lippitt and White, 1958, pp. 510–511].

Though this study of leadership is one of the best from the standpoint of controlled experimentation, the authoritarian leadership was quite harsh and atypical of teacher leadership. One would not expect to find classrooms managed exclusively in an authoritarian or laissez-faire manner, as described in this experiment, except perhaps by beginning teachers or by experienced teachers in unusual situations.

Dominative and Integrative Leadership

Anderson (1943) measured three types of teacher-dominative and teacher-integrative behavior in the classroom. After computing a mental health quotient for the two classrooms he found that domination by the teacher was accompanied by evidence of conflict between the teacher and pupils and tended to produce a low mental health quotient. Integrative behavior, on the other hand, was accompanied by evidence of teacher and pupils working together and produced a good mental health situation. Short examples of both dominative and integrative teacher behaviors are now presented to illustrate the meaning of dominative and integrative behaviors:

Domination with evidence of conflict:

1. Teacher arbitrarily prescribes some activity: "Don't do it that way. I'll tell you what to do."
2. Teacher answers "No" when pupil asks if he can do something.
3. Teacher tells a child to go to another part of the room.
4. Teacher postpones something without giving any reason or setting a future date: "We can't do that now."
5. Teacher uses disapproval, blame, shame, obstruction, or interruption to secure different behavior from a pupil.
6. Teacher uses warning, threats, conditional promises: "If you can't do what you're supposed to do, you'll have to go out in the hall."
7. Teacher calls to attention: "Jimmy, face this way, won't you?"
8. Teacher deprives children of specific materials, activities, rights, or privileges, sometimes practices corporal punishment, sending a pupil out of the room, keeping him after school, and sending him to the principal's office.

Integration with evidence of working together:

1. Teacher helps student to define, redefine, or make progress with the problem. The problem must have been stated and accepted by the pupil.
2. Teacher agrees with, approves of, or accepts the student's contribution. This is a response to spontaneous or self-initiated behavior; approval of the pupil's selection is given when several answers or new answers are possible.
3. Teacher extends invitation to go ahead in response to the pupil's wish, suggestion, or expression of need.

4. Teacher asks questions regarding the student's expressed interest or activity.
5. Teacher comments on such interest or activity.
6. Teacher accepts the responsibility for action by a child that is inconvenient, unjust, or unfair to another child; he also admits his own ignorance or incapacity [Anderson, 1943, pp. 465–468].

The two studies just reported were conducted with children of elementary school age and show that the type of leadership is clearly associated with learning outcomes of the pupils. Much more research is needed before we can arrive at better estimates of how the type of leadership might affect outcomes with high school and college students in a wider variety of settings.

Fiedler (1957) found that in military and industrial life the maintenance of social distance between the leader and his subordinates produced more work from the subordinates. That is, the foremen in an industrial plant who got most work from their men not only were aware of their positions as supervisors but also tended to make certain that the workers were also aware of that leadership role. Similarly, the officers in a military establishment who kept considerable distance between themselves and enlisted men seemed to get higher work output from the enlisted men. Apparently, if the factory supervisor or military officer becomes friendly with those under him, the men tend to provide the leader with information of a personal nature which in turn affects the decisions made by the officer or supervisor. These decisions are then made in part on the basis of how the leader feels about the men rather than purely in terms of securing greater work output.

It should be noticed that Fiedler was dealing with industrial and military organizations. Most schools are not and should not be run in the same manner as a military or industrial organization, because the objectives and personnel are very different. It is possible, of course, that in some college or even high school situations the teacher might be completely unconcerned about the personal characteristics of the students but vitally concerned with the subject matter learned.

Leadership and Instructional Procedures

A classroom may be managed in such way that the teacher assumes almost total responsibility for deciding what the pupils will learn. For example, when a college instructor lectures he is determining largely what the students can learn from listening. Further, if he assigns certain readings and assures the students that they will be subsequently tested only on the lectures and the reading assignments, he is exercising a heavy degree of responsibility for deciding what the students will learn.

Other instructors proceed differently and may not lecture to the whole class. In early meetings with the class one instructor may help the class as a group identify some significant problems and then work with individuals or the smaller groups in finding information, analyzing information, and developing solutions. Still another teacher may work almost exclusively with each individual. For example, the teacher in high school mathematics may early ascertain what each pupil knows and then try to help each pupil progress from that point. In algebra two or three consecutive books in a series in algebra may be available. Starting early in the first semester of the first year, the teacher may help each individual get started, and then each proceeds as rapidly as he can through an entire sequence in algebra work. Some students finish the first-year book in the first semester; others do not finish it in the first year.

A considerable amount of research in recent years has been done in the college setting to ascertain the effects of various forms of teacher leadership designated by such terms as teacher-centered, group-centered, and individualized or tutorial. In this research, there is a close relationship between form of leadership and type of instructional activity.

Guetzkow and others (1954) investigated three methods of teaching: recitation drill, group discussion, and tutorial study in an elementary psychology course. All students enrolled in the course heard a common lecture, were given the same assignments, used the same textbooks, and had the same opportunities to see educational movies and take sample tests as outlined in the course syllabus. The three methods of teaching were varied only in two class meetings per week outside the regular lecture period. In the recitation-drill method the instructor prepared questions and called upon students to answer these questions during the instructional period. A short test was presented during each class period, covering the recitation-drill content. The group-discussion method was arranged by having the students seated in a U shape, with the instructor attempting to promote full participation in discussions of the lecture and textbook content. An essay type of quiz was given every other week; the short quizzes were not given each period. In the tutorial-study plan an individual approach was taken with each student. The student's work was quite undirected; however, the instructor always met with the group to consult with individuals on any problem they might have. Conversation was prohibited among students in this tutorial-study plan.

Three course-wide objective tests were given to all the students, *based on the required work* in the course. Test items were developed to measure facts and principles, to measure the student's ability to apply the facts and principles, and to ascertain their attitudes toward the course. On all criteria no differences of practical significance were found among the three methods of instruction. The researchers concluded, however, that there were many inadequacies in the design of the study. The teachers using the three methods were inexperienced; more important, all the students were required to attend the same lecture session and, in addition, had the same common readings and assignments. It was entirely possible that students learned more outside than during class hours and also that their attitudes may have been affected as much or more by what occurred outside the class periods than within the two class periods per week during which the three methods were supposedly tested.

When an instructor-centered approach was used in four sections and a student-centered approach in nine sections of a psychology class, Rasmussen (1956) also found no difference in amount learned as based on an objective examination. The students in the student-centered sections, however, estimated that they had learned more of practical value and that more behavioral changes would take place as a result of the course than did the students taught by the instructor-centered method. Six months after the course was completed there was again no difference between the groups as based on a second administration of the objective test; but the student-centered group felt that they had changed behavior more as a result of the course than did the instructor-centered group.

Nachman and Opochinsky (1958) studied the effect of class size, but with an important and improved design over the two previous researchers. They measured the immediate effects of presentation of material in a small class and in a large class by using unannounced quizzes. On these quizzes, given immediately at the end of the class period and for which the students had not prepared except by listening and participating in class, there was a significant difference favoring the small class. As expected, the researchers found that on the final examination there was no difference between scores of the students in the small and in the large class. College students apparently study a great deal outside class periods; thus, when attempting to measure outcomes from different methods at the end of a course, one is also measuring what the students have learned, regardless of method used in regular class meetings.

Smith and others (1956) attempted to relate reading achievement to both the student personality and the method of teaching. They hypothesized that college students who were somewhat anxious and permeable would make optimum gains in reading efficiency under a teaching method with a well-defined structure and strong direction by the teacher. Their second hypothesis was that anxious students of impermeable and rigid attitudes would make optimum progress when exposed to nondirective teaching procedures. They found that students characterized as permeable and anxious did make best progress in reading efficiency with a directive type of teacher and a highly organized course. However, those students characterized as impermeable and anxious were not affected by the teaching methods. The general conclusion was that teaching method is related to efficiency of learning in some college students but that further research is needed. Somewhat as in the previous Guetzkow study, difficulties with instruction were experienced in that the instructors felt quite comfortable in the structured, directed situation but quite uncomfortable with the nondirective method.

Faw (1957) also investigated the effects of an instructor-centered lecture method of teaching and a client-centered method of nondirective or more permissive teaching. One type of instructor-centered class was characterized by the imparting of facts and information. A student summarized the method as follows: "It was, of course, filled with facts and information of both a theoretical and practical nature–and it was interestingly taught. Now and then we would ask questions of the instructor, but on the whole there wasn't very much general discussion. We just listened."

The second instructor-centered class was administered by a dynamic lecturer whose chief concern was with the content but who was popular among students and who was also permissive at times with them and a self-acceptant individual himself. One student described fairly well the general feeling of the students in the class as follows: "Mr. —— did a lot of clowning in class and sometimes I felt that what he said was to get a laugh instead of being informative, but he had a way of talking about behavior and the way people feel, in such a natural and matter-of-fact way, that he made you feel normal and natural, even though he did all of the talking. He would sometimes express his own feelings and experiences as natural events and it made you feel, . . . 'Hell, if he can accept his own feelings so easily and comfortably, why then I can accept these feelings about myself.' "

The sections taught by the client-centered or permissive method were characterized by a student as follows: "You feel pretty free in here. For example, things really had gone wrong with me today. It started out by my running out of gas coming to school and I was late to an exam; and then in History class I said the wrong thing and felt like a fool. But then in this class the professor really accepted my contribution. He seemed to understand exactly what I meant and, . . . Gee, I felt better than I had all day. It seemed like I got through to someone. You don't have to pretend in here. On the other hand you get as much information as in other classes (Faw, 1957, pp. 138–139)."

After having experienced the three methods of instruction, the students were put in a stress situation. The experimental stress situation was created by first assuring the student that all examinations would be announced in advance. However, without any advance announcement the students were given a "pop" quiz and verbally assured that this was an important test insofar as their total mark for the course was concerned. Further, they were given a limited amount of time to complete the test, and when they were about three-fourths finished, time was called to hand in the papers. Immediately after time was called, a word association test was used to measure the effects of stress upon them. Again, these papers were called in before sufficient time had elapsed for completion. At this point the experimental situation was explained to the students, and it was pointed out that it was an experiment and that grades would not be recorded. The students were then invited to write their reactions from the first of the period up to the present time. These written comments were subsequently analyzed by two psychologists independently. Finally, the students responded to an opinion type of test to indicate the extent of their anxiety. Analysis of the information showed that the students who had experienced the permissive teaching showed less stress than did those who had experienced instructor-centered teaching; anxiety was highest in the instructor-centered classes and lowest in the permissive or client-centered classes.

The above studies suggest that much can be found out about the effects of leadership though careful experimentation. Undoubtedly, with improved design, including better controls over the experimental arrangements, more generalizations which might apply to the elementary and secondary school will be derived. It is true, however, that college classes are more readily open for research than elementary or high school classes and that it is easier to arrange various forms of teacher leadership in college classes.

Restrictions upon Teacher Leadership

Several groups of factors impose restrictions upon the form of leadership which the teacher employs: the personal characteristics of the teacher, the characteristics of the classroom as a group, the nature of the learning outcome, and the administrative and curriculum arrangements within the school. Each of these is now discussed briefly.

Some teachers simply cannot become highly authoritarian in their relationships with the learners. They have experienced life thus far and have built a value system which does not permit them to live comfortably with themselves and impose their will upon a group of learners in the manner as outlined previously by Lippitt and White. Other teachers cannot live comfortably with themselves and allow much decision-making by pupils about the conduct of the class. They like a more orderly situation and are bothered when five or six different groups of students engage in different activities in the classroom, especially when such activity is accompanied by student discussion and movement. Still other teachers feel that the information they possess is so important that they must use most of each class period to present this information to the learners as a whole group. The large body of teachers is perhaps somewhat flexible and can vary the form of leadership according to the outcomes desired and the nature of the group.

The characteristics of the learners as a classroom group pose some limitations on the form of teacher leadership. For example, in a high school class of seniors where the students are eager to learn and behave well, the teacher could have a considerable amount of group work and also individualized instruction. In the kindergarten, third, or any other grade with a group of antisocial, misbehaving children, the teacher would necessarily be somewhat authoritarian at first and place restrictions upon the class so that an orderly work situation could be started. Subsequently, the teacher could purposefully give the pupils more responsibility for self-control and planning of activities as they are ready to perform such responsibilities well.

The type of learning outcome desired also places a restriction upon the type of leadership. Pupils must be given opportunity to interact with one another in order to develop communication and other social skills. In this case, one is required to use some form of group-centered activity rather than to lecture to the whole class or to use completely individualized assignments. On the other hand, in psychomotor areas such as typewriting or handwriting, the learner must necessarily do much individual work. One cannot learn to typewrite efficiently simply by talking to other students about typewriting; instead one must practice the typewriting. In handwriting, too, discussion may be helpful in arousing motives, but to develop skill, each individual must practice handwriting. In most situations, various patterns of leadership rather than the same form are called for. At times the teacher must be forceful. To develop social skills, attitudes, and values, group-controlled activities are called for, and rather complete freedom is given to pupils at times to encourage initiative and the assuming of responsibility.

Administrative and curricular arrangements within a given school also set some limits on the form of leadership. A teacher may be placed in a situation where he is required to get each student to a certain point in arithmetic or spelling, for example, by a certain time. In turn, this kind of requirement on the teacher may mean that for a portion of time each day a definite attempt is made to acquaint all pupils with certain information or to develop a minimum level of skill. It is possible also that a principal might insist that during regular class periods every student be in his seat, working at some type of individual activity, or engaging as a classroom group in some form of group instruction. In other situations, there may be no specific requirements concerning work to be accomplished or activity of the pupils. In these more desirable situations, the teacher can more effectively carry out appropriate leadership.

THE TEACHER AS A HELPFUL PERSON

Regardless of the form of leadership or personal characteristics, the teacher must be helpful to the learners in acquiring intellectual and related cognitive skills, psychomotor skills, and other learnings in the affective domain. The learner experiences no satisfaction or success in a classroom unless he is helped to achieve one or more of these outcomes and preferably all three.

As Getzels and Thelen (1960, pp. 53–82) point out, the classroom is a planned learning environment in that the school board or other regulating agency has indicated generally what is to be learned, who is to do the learning, and who is to exercise leadership and assume responsibility for the conduct of the classroom. The teacher is responsible to school officials and, less directly, to the school board and community for interpreting these demands to the students. Though students can and do learn through interacting with one another in the classroom, it is the teacher who can be most helpful to the students as individuals and as a group. And the means of helping students are manifold (Trow, 1960, pp. 30–50). The teacher not only guides the more formal instructional activities but also works with in-school and out-of-school persons and groups to improve learning opportunities for the students.

Further, students seek help from a respected and admired teacher in solving a variety of problems originating in the home, neighborhood, and school. They need guidance in becoming reasonably effective and happy individuals and in contributing to the welfare of other members of the class. For example, the withdrawing child is assisted in becoming better adjusted to the group and the highly aggressive child in finding some constructive means for releasing his aggressive feelings.

What are the behaviors of a helpful person? Thomas, Polansky, and Kounin (1955) ascertained what young college students thought were the characteristics of a helpful person. The person whom the college student perceives as helpful does these things: considers the problem of the student important, shows willingness to maintain communication with the student, and also is willing to communicate with the student about a broad variety of topics. The students also judge that a helpful person is not only sensitive to the student's possible tension or discomfort in an initial interview but also shows that he wants to help reduce that tension or discomfort. Finally, the helpful person does not allow the student while under tension simply to sit or to express ideas about anything. The helpful person structures the interview or other meeting with the student in such way that it is more readily possible for the student and the helper to gain insights into the nature of the problem and to find solutions to it.

While behaviors of the helpful person as described above may seem to result from common-sense observations, it is surprising to find the large number of teachers in the intermediate grades, high school, and college who make no attempt to be helpful to the student in overcoming learning difficulties directly connected with the subject matter. Further, some high school teachers and many college teachers seem to think that their only responsibility is to impart information via lectures, to tell students what information to learn and the sources of it. Much teacher leadership yet is confined to knowing the subject matter moderately well and then telling students what to learn and when to have it learned.

PUPIL–PUPIL INTERACTIONS

When given the opportunity, pupils communicate and otherwise interact with one another in the classroom. If not given this opportunity in the classroom, they interact in all types of informal meetings at school, going to and from school, and in the neighborhood. Interaction among pupils in the classroom can be guided to achieve useful ends.

Classroom groups vary in cohesiveness and other characteristics. Students in a very large high school or university meet for the first time in a class and are merely a collection of individuals unknown to one another. Given the opportunity, they soon form acquaintanceships and mutual friendships. Students who have lived in the same neighborhood and have attended the same school for some time come to the classroom already known to one another and may be, independently of the teacher, grouped into cliques. That is, groups of three to five individuals within a class may already have formed good friendships and associations with one another but do not associate with other members of the class. In some classrooms there are not only cliques but also majority–minority groups. The minority group of two to five pupils may interact freely and often with one another, whereas the majority group does not interact with the minority.

Group Cohesiveness

The goal to be sought in most classrooms is a highly cohesive group. A cohesive group is one in which all of the members wish to stay in that group; in other words, the members are sufficiently attracted to one another or to the group activity that they wish to stay in that particular classroom. Figure 5.7 shows a classroom group of high school juniors that is not highly cohesive. In the upper left-hand corner are four girls who gave mutual choices. When they were asked to list their five best friends in the class, these girls chose one another but, though given the opportunity, chose no one outside the group of four. In turn, only two girls from the entire class chose one of them as a friend and that as a fourth or fifth choice. In the lower right-hand corner is another clique; however, two of the three girls in this group gave choices to a boy outside the group. On the left side are shown two boys isolated from the rest of the class. They neither listed another member of this high school class as a friend nor did they receive any choice as a friend from any member of the class. The sociometric test on which Figure 5.7 is based was administered on the West Coast in a large high school shortly after World War II. Both isolated boys were of Japanese descent and had only recently come back to this school after having been previously transferred outside the state during World War II. Thus, this class of juniors was characterized by some cliquishness, a majority–minority pattern with resulting isolation, and one strong male leader as shown toward the center of the diagram. It was not a cohesive group.

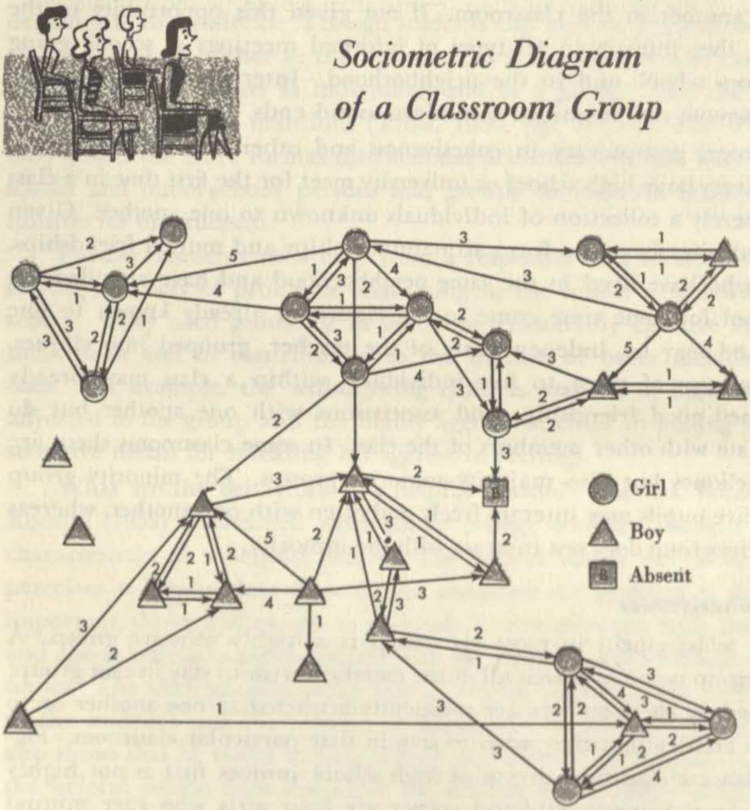


FIGURE 5.7. *(Adapted from Klausmeier, 1958, p. 54.)*

Consider now the effects of different bases of cohesiveness: personal attraction, performance of a task, and maintenance of group prestige (Back, 1951). Each group was composed of two college students. When cohesiveness was based on personal attraction, the group members tended to transform their work activity into a long, pleasant conversation. When cohesiveness was based on getting a job done, the members tried to get the job done quickly and efficiently, spending little time in conversation unrelated to the task. When cohesiveness was based on group prestige, the two members risked as little as possible to endanger their prestige status and acted cautiously, concentrating on their own actions and adjusting as best as possible to the partner.

In a somewhat similar study, Exline (1957) divided a larger college class into groups of five people of the same sex. The group members who were congenial with one another were more accurate in perceiving what was appropriate behavior related to the task than were members of noncongenial groups. Exline had anticipated that members of noncongenial groups would be more accurate in perceiving the interpersonal relations and feelings among the members of their groups than would be individuals who were congenial. However, such was not the case.

What is the effect of success and failure on group cohesiveness? Among groups of second- and fourth-grade children, social status rose for all members of the classroom group when they experienced success in a common small group activity (Heber and Heber, 1957). However, the social status was lowered if the group experienced failure in the activity. The effect of the group's experiencing success lasted over a period of time, whereas experiencing failure was not permanent. This research suggests that in the elementary grades group cohesiveness is increased by some form of group activity in which all members of the group feel successful in their accomplishment.

To establish cohesiveness within smaller groups, the teacher may divide the whole class by putting friends together in the same group, putting learners together who have an interest in the same activity or a common goal, or putting congenial individuals together in the same group. Also, the task or activity can be arranged so that the members experience success feelings or secure prestige through doing the job well. To establish cohesiveness in the total group, it appears essential to identify a problem or an activity in which the entire group can participate, with each member contributing something and with the entire activity being successfully accomplished. The latter is an extremely difficult task in most classroom situations. To identify some activity on which the whole class will work as a group with each contributing something worthwhile is in itself a major accomplishment. Subsequently, to work with individuals and smaller groups within the class so that each member, or at least most members, experiences a feeling of success is one of the most difficult tasks a teacher can set for himself.

Pupil Leadership

Leadership characteristics emerge in children's groups in the primary grades. With teacher guidance, group activities can be arranged in which most, if not all, children develop some leadership ability. And this in no way denies that all children should acquire excellent independent study habits and many individual skills. As emphasized earlier, only certain objectives can be achieved through group activities, and two of these are social skills and related leadership abilities. Research dealing with pupil leadership and high acceptance of a pupil by other pupils is now considered.

Bonney and Powell (1953) identified the highly accepted and not highly accepted children in a first-grade class. Behaviors most common to the highly accepted were more conforming to classroom requirements and expectations, abiding more by the teacher's definition of appropriate behavior in the situation, smiling more frequently, engaging more frequently in some form of cooperative voluntary group activity, making more voluntary contributions to the group, and spending less time alone during free play or activity periods. Bretsch (1952) similarly investigated the behaviors of highly accepted and unaccepted or poorly accepted ninth-grade adolescents. The better-accepted students more frequently showed ability to perform such social skills as dancing, carrying on a conversation, singing, playing cards, playing a musical instrument, swimming, tennis, and skating. Further, in five of the skills, a greater percent of girls than boys possessed a higher degree of skill, according to their own estimates.

Gallagher (1958) reported a tendency for elementary school children of higher intelligence and higher achievements to be somewhat more accepted than those of lower intelligence and achievement. However, he also found that living close together in the neighborhood was an important factor in choosing friends and was quite independent of intelligence. Similarly, Klausmeier and others (1960) found that informal meetings and being together in curricular activities or attending various school events were more important as the bases of friendship for high school students of high, average, and low intelligence than were attending the same sectioned classes or elective classes. Though the students of high intelligence were placed in the same classes, most of their friendships were formed outside the classes.

The factors influencing the formation of informal groups of adolescents are highly complex (Phelps and Horrocks, 1958). Socioeconomic status was related to adolescents' groupings and to their attitudes and activities, but it did not appear to be the dominant factor. The degree of emancipation from adult control appeared to be the most important influence in the formation of informal, adolescent group activities and attitudes. That is, students in Grades 7 to 12 appeared to form groups more on the basis of the extent to which they were free from adult control than on other bases such as intelligence, socioeconomic status, or appearance.

The above research suggests that informal groupings of children and youth are made on a variety of bases. Leadership in such groups is partly based upon being known favorably and also being helpful to the members. Fifth-graders elect a child to serve as class president who is well known and who the pupils think will be helpful to them. The high school football team elects a captain who they think will carry out his role efficiently and for mutual benefit of the members. The prom queen selected in the high school or college is usually well known to both males and females, for one reason or another is attractive to them, and handles herself in such a manner that the majority feel that in this capacity she will be an excellent representative of the group.

SUMMARY

The classroom is one type of behavior setting for learning. In the classroom, the students and teacher serve as stimuli for one another, social–emotional need gratifications may be sought and found by the students and teacher, and immediate reinforcement and confirmation of many responses directly connected with learning tasks may occur. These desirable features occur to the extent that the communications between the teacher and students and among the students are effective.

The leadership exercised by the teacher must vary according to such factors as the type of learning outcome desired, the size of the group, the nature of the group, and the personal characteristics of the teacher. For the development of social skills with no loss in the learning of the usual subject matter, integrative leadership, which fosters individual pupil initiative, and some group activities are desirable.

The professional teacher deliberately varies the type of leadership to meet the demands of particular situations. But, regardless of the type of leadership, the teacher must be perceived by the students as a helpful person. Students perceive a helpful person as one who considers the problems of the student important, communicates with the student on a variety of topics, and helps the student with his problems.

QUESTIONS AND ACTIVITIES

1. Describe briefly how the classroom serves
   (a) as a stimulating environment;
   (b) to satisfy social–emotional needs;
   (c) to provide for reinforcement and confirmation of behaviors.
2. (a) What means does the teacher have of communicating to students?
   (b) What means do the students have for perceiving the teacher's communications?
   (c) Describe a complete cycle of communication.
3. (a) Discuss the three patterns of teacher behaviors which Ryans found to characterize successful teachers.
   (b) Compare these patterns with the pupils' reactions given in Table 5.1.
4. On the basis of your experience as a student, give an example of a violation and an implementation of each of the four principles essential to the improvement of group living.
5. State and discuss briefly three generalizations from the Lippitt and White studies which you accept as applicable to yourself as a leader.
6. Based upon your own experiences as a student, describe
   (a) a situation characterized by dominative leadership;
   (b) a situation characterized by integrative leadership.

7. (a) Referring as necessary to the complete article, write a brief summary of one of the studies cited in the section on leadership and instructional procedures.
   (b) Why is it difficult to design and execute a study to ascertain the relationship between leadership of instructors and outcomes in the cognitive and affective domains acquired by students?
8. Discuss which two of the possible restrictions upon teacher leadership might be most difficult for a teacher to modify or change.
9. Describe the behaviors of the teacher who has been most helpful to you.
10. (a) What conditions are associated with group cohesiveness?
    (b) Under what conditions might group cohesiveness constitute a problem for the teacher?
11. What types of learning activities are needed to develop student leaders?
12. Make a careful analysis of your strengths and weaknesses as an educational leader.

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SUGGESTIONS FOR FURTHER READINGS

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Part II Achieving Learning Outcomes Efficiently

The teacher with concentrated study in a subject field often thinks of the outcomes of instruction as only from that subject field. In Part II, outcomes of human learning for all age levels and in all areas of human experience are organized under three headings: Cognitive—Facts and Concepts, Chapter 6; Problem-Solving and Creativity, Chapter 7; Psychomotor, Chapter 8; Affective—Attitudes and Values, Chapter 9; and Personality Integration and Character, Chapter 10.

In each chapter, the outcomes and underlying processes are defined and illustrated first; then, developmental trends in acquiring the outcomes are given; finally, the principles for improving efficiency of learning the outcomes are treated. The principles are applicable to the outcomes as such; but, as shown in Chapters 1 to 5, student, teacher, and situational variables also affect efficiency of learning any outcome. Principles and information related to motivation, individual differences, transfer, and contexts of learning are presented in Chapters 11 to 14.

In many books principles of learning are stated in single words such as "motivation," "exercise," "readiness," "reinforcement," and "association." These single terms carry many different meanings, especially to persons unfamiliar with learning theories. Part II attempts to avoid this problem by stating each complete principle in such a way that it may be a clear-cut guide for achieving the outcome efficiently. Thus, each principle starts with a verb; the teacher or other person who guides learners in informal or more formal settings is the assumed subject.

Chapter 6 Cognitive Learning Outcomes I: Facts and Concepts

How does a person acquire facts and concepts? What conditions facilitate this learning? Which cognitive abilities, as shown in Table 1.1 of Chapter 1, are required to learn facts and concepts? Our answers to these questions are not so complete as is the agreement that the acquisition of facts, concepts, and related intellectual skills is an important outcome of school learning. Children demonstrate these outcomes in reading the printed page with meaning, solving mathematical problems, understanding and using the symbols and vocabulary of science and social studies, and in many other curriculum areas.

The purpose of this chapter is to help you extend and broaden your present concepts about achieving outcomes of learning in the cognitive domain. The chapter is organized as follows: (1) the nature of facts, of concepts, and of knowledge; (2) perception, discrimination, and abstraction in concept learning; (3) developmental trends in concept learning; (4) principles for facilitating the acquisition of facts; (5) principles for facilitating the learning of concepts. In Chapter 7, problem-solving and creativity, two other important outcomes in the cognitive domain, are treated.

THE NATURE OF FACTS, CONCEPTS, AND KNOWLEDGE

A *fact* is something that has happened, an event, an actual state of affairs. A *concept* is the meaning or meanings that the individual associates with words, other signs, and direct sensory experiences, and the meanings are based upon discriminations and associations. Concepts are not formed in the absence of facts; however, facts can be memorized and recalled without associating meaning with them.

Examine a quotation to see the relationship between facts and concepts. I say to you (a person who has acquired the requisite facts and concepts needed to read and understand), "My phone number is Cedar 3–9289." The total information embodied in the quotation is a fact—an actual state of affairs. Examine now the large number of discrete facts and concepts embedded in the entire quotation which give it the desired meaning. You and the author must accept all the facts about the proper form for each letter and numeral in the quotation, and also the spelling and pronunciation of the words, in order to communicate to one another. But beyond the facts on which my writing and your reading are based, we must also have made previous associations and discriminations so that the words and numbers have meaning; for example, *my* refers to the author and not to any other person; *phone* must mean telephone and not car or street or any other thing; *number* must carry a meaning associated with identification and not with how much or how many; and *Cedar 3–9289* must carry the usual meanings connected with telephone usage. The meanings you already possess of the words and numerals in the quotation are your concepts of what the symbols stand for in actuality. A person from a foreign country could be taught to say the quotation correctly without any understanding of the words; in this case he would simply be associating the forms of the words and numbers with the names we ascribe to them; he would be making meaningless arbitrary associations between symbols and names.

In Chapter 2, one objective of elementary education was said to be knowledge and understanding (Kearney, 1953). In the same chapter, one of two main categories of learning outcomes in the cognitive domain was classed as Knowledge, with subclasses as follows: Knowledge of Specifics—terminology, specific facts; Knowledge of Ways and Means of Dealing with Specifics—conventions, trends and sequences, classifications and categories, criteria, and methodology; Knowledge of the Universals and Abstractions in a Field—principles and generalizations, theories and structures (Bloom, 1956, pp. 201–204). Bloom stated that knowledge could be demonstrated without the individual's exhibiting meaning or understanding; he set up the second classification of outcomes in the cognitive domain to include the intellectual skills of comprehension, application, analysis, synthesis, and evaluation. *Fact* in this chapter is used in much the same sense as Bloom and Kearney used the term *knowledge* in Chapter 2.

Facts

In the previous example the calling of a word or number by a certain name was indicated as a fact or arbitrary association. Consider the field of the language arts further. The spelling and pronunciation of every word are somewhat arbitrary, and in those instances where a word is not pronounced or spelled phonetically, both the pronunciation and spelling, though accepted by all of us adults who pronounce and spell correctly, are quite arbitrary. Rather than trying to explain to a child why *threw* and *through* are pronounced and spelled the way they are, it is better simply to accept these as facts to be learned as such. The names given to the parts of speech, to the parts of a sentence, to punctuation marks, and to the marks used in pronunciation are likewise facts to be accepted. Once we accept the fact that *noun* is a word, we can go ahead with acquiring the concept of *noun* as a word used to name a thing, quality, or action.

The learning of a foreign language involves, in large measure, the acquisition of facts. If a person already speaks his native tongue fluently and attempts to teach himself a foreign language with use of an appropriate dictionary, he will at first make a large number of arbitrary associations between words in his and the foreign language. Not until he starts to think in the foreign language will he use the words of the foreign language with much meaning.

Turning to the field of mathematics, we can see readily that the names given to all the symbols are arbitrary. There is no reason, other than historical, why the minus sign should not be called "plus." We are so accustomed to counting 1, 2, 3, . . . that any other method of counting seems inherently wrong. However 1, 2, and 3 might as well have been symbols for "nine," "seven," "four." And, with the prominence now given to computers in our society, the binary system of counting may come to seem "righter" (that is, more familiar) than the decimal system for counting. The child's learning to count sequentially from one to ten is largely a matter of learning the names ascribed to numbers; his first calling the symbols of mathematics properly is also an example of learning accepted facts. Equally important, the commonly called addition, subtraction, multiplication, and division facts are not arbitrary or meaningless or should not be. Once the cardinal meanings of the numerals are established as concepts, i.e., 1 is one something, 2 is two somethings, and the process of adding, counting to or upward, and subtracting, counting from or downward, are learned with meaning, the child can acquire the so-called addition and subtraction facts as meaningful generalizations.

Social studies learning also involves acquisition of facts. Certain feats were accomplished at certain points in time; each city can be located at a certain longitude and latitude; and countries have specific boundaries, including specifically named oceans, rivers, and the like. Consider items in your present knowledge that are factual—things generally accepted by anyone who has the opportunity to know them. Which of these should children also accept and learn as facts? Which, if any, did you learn by rote methods? Which did you acquire through purposeful learning as outlined in Chapter 1? Which did you acquire through some process or processes of imitation and conditioning as outlined in Chapter 1?

Concepts

Man has developed many concepts for intepreting and communicating about the world about and within him. These meanings, in turn, are systematically incorporated into symbols—words and signs. Man experienced space and time before he invented the words to convey the meanings of the experiences. Somehow, children are to acquire quickly not only some of the experiences but also the symbols, so that in speaking, reading, and writing activities they may acquire and transmit correct meanings with the use of symbols. Further, with a relatively large and complex system of symbols, man is now able to describe quite accurately phenomena which he cannot experience directly. Much research is being conducted at present about the nature of minute particles or forces and also about the nature of space, neither of which can be experienced directly.

Some concepts are relatively simple and represented by single terms such as *large* and *small*. Events and objects have characteristics which permit the kind of grouping which leads to the abstract property of largeness or smallness. Though there is always some frame of reference from which things are called large or small, each of these terms carries meaning within itself.

Some concepts are complex and require more than one term to convey meaning. After having seen large numbers of parents bringing young infants from the maternity ward of the hospital, one concludes or generalizes that boy babies are wrapped or dressed in blue and girl babies in pink. The entire set of terms conveys a generalization—infant boys are dressed in blue and girls in pink. Several single-term concepts are combined to express the larger meaning in a generalization.

Principle is the term that is used to indicate generalizations that imply action. In this and subsequent chapters certain sections are headed "Principles . . . ." These principles are generalizations which explain a large number of related phenomena and which may serve to guide the reader's actions in improving his own learning and that of students he might teach.

How much of the subject matter in your major field of interest is embodied in concepts? Undergraduate students often are accustomed to thinking of outcomes of learning as the organized body of facts in the specific courses they are taking. They think rather narrowly about learning a group of facts and related skills in English, another independent group in psychology, in history, in chemistry, in art appreciation, and so on. But many of the most important outcomes of college as well as elementary and high school education are concepts that cut across organized subjects, that is, understanding of man's experiences as incorporated in symbols. Further, the efficient acquisition of concepts is much the same, regardless of the organized areas of man's experiences in which the concepts are encountered. Though efficient acquisition is much the same, this in no way denies that two persons must necessarily arrive at the same concept through studying identical facts. Some of the real differences among men and nations in part results from different interpretations of the same facts.

PERCEPTION, DISCRIMINATION, AND ABSTRACTION IN CONCEPT LEARNING

Sensing and discriminating are required in learning facts. Beyond these, perceiving and abstracting are required in concept learning.

Sensory Experiences

The direct contact that the individual has with the outside world is through sense organs. In turn, sensory experiences are essential to concept learning. Although thinking and imagining may occur in the absence of direct and immediate sensory experiences, the content of thought and imagination is to some extent based upon previous sensory experiences.

The principal senses are vision; hearing; olfactory (smell); gustatory (taste); the cutaneous senses of heat, cold, pain, and pressure; the kinesthetic senses involving muscles and joints; and the labyrinthine sense of balance. Essentially, the various senses act in a similar way. Some form of energy such as heat, light, or pressure acts as a stimulus. The energy produced by stimulus objects meets receptor cells such as those in the eye or ear, and the activated receptor cell, in turn, starts impulses in nerve cells. Electrical charges accompany the nerve impulses, and the sensory impressions are then sent by the nerve to the brain. The brain, in turn, is influenced by these inputs and serves as an integrator.

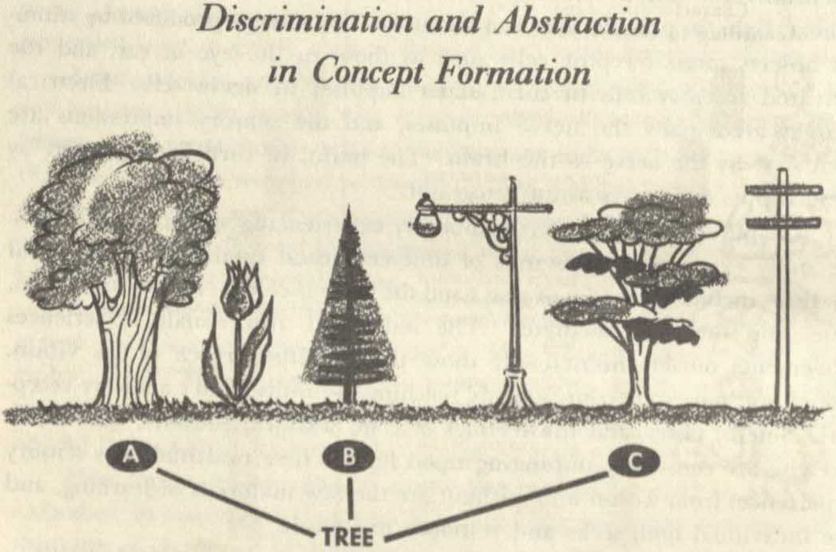
An individual awake is continuously experiencing sensory stimulation. He daily experiences thousands of different visual qualities. These visual qualities include all shades of grays and the various colors—red, yellow, green, blue, and their intermediates. The individual also visually experiences movements outside himself—all those things within reach of his vision. Tones and noises are continuously reaching the individual's auditory receptors. Smells, tastes, and the feelings of cold, warmth, pressure, and others likewise are constantly impinging upon him. These multitudinous sensory experiences from within and without are the raw materials of learning, and the individual both seeks and responds to stimuli.

Discrimination and Perception

The infant lying in his crib on the sun porch senses the approaching thunderstorm with its lightning flashes and cracking thunder. He does not have to learn in order to sense the flashing light or the thunder. He is born with sense organs and, with maturation, is increasingly aware of sensory stimulations. But if he is ever going to be aware that lightning and the light from a flickering neon sign are different or that the pealing thunder and the crashing of a falling object are different, he must discriminate. If the discriminations he makes between these phenomena are to be communicable, he must learn the symbols and words for this communication. When the child has had sufficient experiences with thunderstorms and related terminology that upon seeing lightning he calls it "lightning" and upon hearing thunder calls it "thunder," we know that he has discriminated and that he can use the symbols to communicate verbally. Similarly, when the child sees the numerals 1, 2, 3—sensory experiences—discriminates the three symbols, and understands that they refer to one, two, or three somethings, he is associating proper meanings with the sensory experience. He is perceiving and acquiring a beginning concept of number.

Abstraction

Figure 6.1 illustrates discrimination and abstraction in concept formation. Assume that many trees and tree-like objects are in the individual's environment. He senses the objects, discriminates among them, and calls them correctly by name. The first tree he saw and called correctly was his concept of tree at that time. But he also saw other trees and called them so. He noted likenesses and differences among the various trees. Now when asked what is a tree, he responds, not with the specific characteristics of each tree he has seen, but with the qualities or characteristics that he has abstracted from all of his experiences with trees.



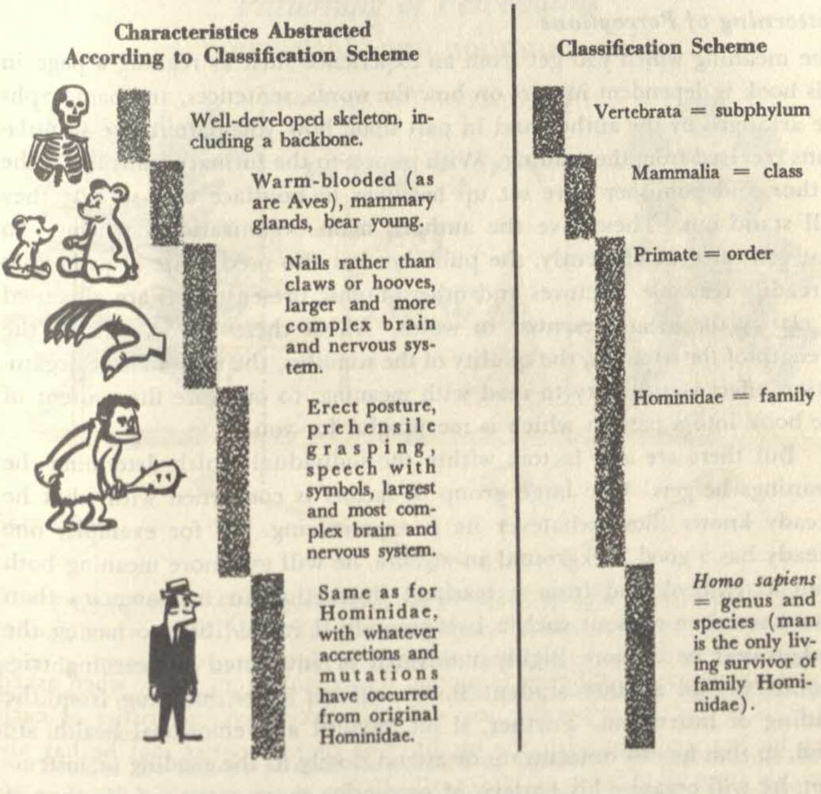
Discrimination and Abstraction in Concept Formation

FIGURE 6.1. *(Adapted from Ringness, Klausmeier, and Singer, 1959, p. 217.)*

In this sense, a concept is both less and more than the instances or direct experiences from which it is formed. One's concept of tree includes only part of the structural characteristics and other qualities of each tree representation in Figure 6.1. In this way it is less than any one of them—A, B, or C. At the same time, the concept *tree* is also more than any one of them for it includes characteristics or meanings based upon all three.

A second example may clarify the abstract nature of concepts and also the discrimination or classification aspect of concepts. Suppose that you are asked to clarify the concept of man, only in relation to the animal kingdom, not on other bases. You cannot simply give as examples of the concept all your specific instances or experiences with man and other animals; you must deal with the abstract qualities or characteristics. If you have studied biology, your verbalizations may go somewhat as in Figure 6.2.

Abstraction and Classification Scheme of Animal Kingdom Applied to Man



Characteristics Abstracted According to Classification Scheme

Well-developed skeleton, including a backbone.

Warm-blooded (as are Aves), mammary glands, bear young.

Nails rather than claws or hooves, larger and more complex brain and nervous system.

Erect posture, prehensile grasping, speech with symbols, largest and most complex brain and nervous system.

Same as for Hominidae, with whatever accretions and mutations have occurred from original Hominidae.

Classification Scheme

Vertebrata = subphylum

Mammalia = class

Primate = order

Hominidae = family

Homo sapiens = genus and species (man is the only living survivor of family Hominidae).

FIGURE 6.2.

Man is of the genus and species, *Homo sapiens*; of the family, Hominidae; of the order, Primate; of the class, Mammalia; and of the subphylum, Vertebrata. Man is different from other animals in that he has erect posture, prehensile grasping, speech with symbols, and the largest and most complex brain and nervous system of all animals. But he is like some other primates in having nails rather than claws or hooves. Like other animals of the mammal class, man is warm blooded, has mammary glands at which the young suckle, and bears offspring; in these respects, man as a mammal is also different from all other classes of animals. Like other animals of the subphylum Vertebrata, man has a backbone; this also distinguishes him and other animals of this phylum from all animals in sixteen other phyla.

If you are thoroughly conversant with the animal kingdom, you will also know the characteristics of other phyla, classes, orders, and families of animals. This helps you to discriminate man more concisely from other animals, and it also helps to make the abstractions as applied to man more meaningful.

Patterning of Perceptions

The meaning which you get from an experience such as reading a page in this book is dependent in part on how the words, sentences, and paragraphs are arranged by the author and in part upon how you pattern the stimulations received from the reading. With respect to the format of this book, the author and publisher have set up headings in boldface type so that they will stand out. These give the author's main organizational scheme. So that you can read efficiently, the publisher has also used a size of print that is readily readable. Pictures and other graphic presentations are also used to clarify the ideas presented in words. All of these factors such as the strength of the stimulus, the quality of the stimulus, the size, and the organization affect your ability to read with meaning, to organize the content of the book into a pattern which is meaningful for you.

But there are also factors within the individual which determine the meanings he gets. One large group of factors is concerned with what he already knows about whatever he is experiencing. If, for example, one already has a good background in algebra, he will get more meaning both from a textbook and from a teacher's instruction in trigonometry than would someone without such a background. If in addition to having the background he is more highly motivated or interested in learning trigonometry than another student is, he will get more meaning from the reading or instruction. Further, if his physical and emotional health are good, so that he can concentrate or attend closely to the reading or instruction, he will organize his pattern of perception more meaningfully than if these distracters produced by poor health existed. Beyond these factors also, individuals acquire somewhat unique ways of organizing their perceptions into more meaningful patterns.

Normally there is a tendency to scrutinize or survey the whole perceptual field. After this survey of the whole, the tendency is to focus upon the parts. There may be considerable scrutiny of the various parts of a picture, for example, or of certain sentences in a paragraph. After this close scrutiny, which leads to discrimination of the parts, the process then is to bring the better perceived parts through integration into a more meaningful whole.

The attempt to pattern can be clarified by examining the various arrangements in Figure 6.3. As you looked at A, B, and C you probably found C most readily identifiable as an animal, perhaps as a cat or a toy bear. You probably next figured that B contained the words "perception and learning." After scrutinizing A at length, you may or may not have tentatively decided what it was. It is an ink blot formed by placing a drop of ink on a flat sheet of paper and then folding the paper. Whatever meanings you associate with it are peculiar to you. If a large number of individuals saw

Patterning of Perceptions

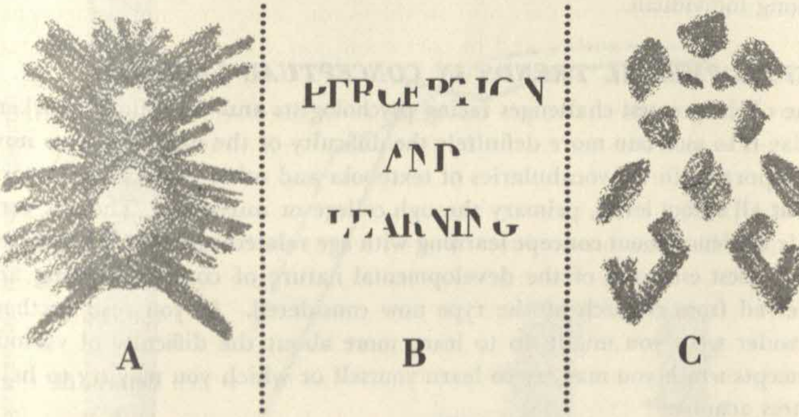


FIGURE 6.3.

C, some agreement could probably be reached among them that it is an animal; most would recognize the same three words in B, but there would be wide differences as to what A really is. However, no matter how vague the object, every motivated person normally tries to pattern his perception of it into meaning.

Besides the factors already mentioned as inherent in the stimuli and the individual, all perception is somewhat dependent upon the affective state of the individual. Murphy stated that affect, as one factor in perceptual learning, can intensify or weaken certain aspects of a perceptual response in such way as to influence later perceptual responses, e.g., it can result in perceptual learning. He considered only one, but a very important, dimension of affect—the pleasant-unpleasant or neutral—and hypothesized that "(a) . . . perceptual structure changes in such fashion as to give *emphasis* to that which is pleasant, in contrast to that which is unpleasant or affectively neutral; (b) many such changes are *cumulative*; . . . This means that directional modifications in cognitive structure are made as a result of affective factors. . . . It is suggested that positive affect not only plays a vital role in the *modification* of perceptual responses, but that it is a clue to some forms of perceptual learning (Murphy, 1956, pp. 2–3)."

Jenkin (1957) reviewed a large body of experimental studies dealing with affective processes in perception. He concluded that the motivational state, the physiological need state, and the nature of the stimulus on a positive to negative or threatening basis are related to the individual's perception. Experiments thus far have most clearly established the generalization that positive affect is associated with the individual's making more accurate perceptions and recalling them, whereas threatening or noxious stimuli lead to avoidance and forgetting. Jenkin concluded that all three factors need further study and that their relationships to perceptual learning may vary among individuals.

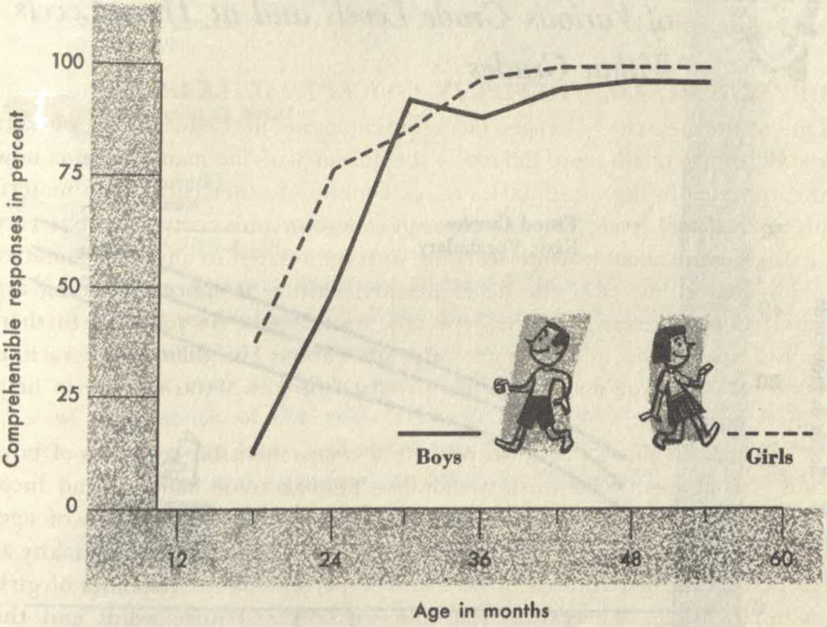
DEVELOPMENTAL TRENDS IN CONCEPTUAL LEARNING

One of the greatest challenges facing psychologists and educational workers today is to ascertain more definitely the difficulty of the many concepts now incorporated in the vocabularies of textbooks and other curriculum materials at all school levels, primary through college or university. There is very little evidence about concept learning with age related to any subject-matter field. Best estimates of the developmental nature of concept learning are inferred from research of the type now considered. As you read further, consider what you might do to learn more about the difficulty of various concepts which you may try to learn yourself or which you may try to help others acquire.

Figure 6.4 shows the mean percent of comprehensible responses of boys and girls at ages twelve to sixty months. Though some babbling and incoherent sounds are produced by the infant prior to twelve months of age, Millard (1951) found that not until eighteen months of age were as many as 13 percent of the responses of boys and 38 percent of the responses of girls comprehensible. Thereafter, the young children acquire words and the meanings for which the words stand very rapidly, so that at about age thirty-six months nearly 100 percent of the children's responses are comprehensible. If one listened to the conversation of the children of kindergarten age or asked questions which they understood, he would find that nearly all their responses were comprehensible.

A large number of studies have been done on the size of vocabulary at various ages. These studies usually involve posing questions to which the child responds verbally or using paper-and-pencil tests in which a word is given and the child is to underline another word or phrase which means about the same. Though there are many disagreements about how to measure vocabulary, a study by Smith (1941) shows the general trend in concept development during school years.

In Smith's study a word was defined as a dictionary item. Basic words were designated as those which are printed in the dictionary in heavy type as separate entries along the margin of the page; for example, *loyal* is found in heavy type as a separate entry and is considered a basic word; *loyalize* is not found as a separate entry and is considered a derived word.



Mean Percent of Comprehensible
Responses of Boys and Girls
12 to 60 Months of Age

FIGURE 6.4. *(Adapted from Millard, 1951, p. 150.)*

With these descriptions, Smith administered a vocabulary test to three fairly large samples of children: all those enrolled in Grades 1 to 12 of two medium-sized schools and all those enrolled in Grades 1 to 8 of another school system. The items or words of the vocabulary recognition test were read to children of primary school age; at the intermediate and junior high levels some help in reading the test was given to the children; beyond this school level it was assumed that the subject could read and respond properly. Figure 6.5 shows the average number of basic words for children at each of the twelve grade levels and also according to Quartile 1, Median, and Quartile 3. Quartile 1 is the point below which 25 percent of the total group scored; the Median indicates the point below which the lowest 50 percent scored; and Quartile 3, the point below which the lowest 75 percent scored. As shown in Figure 6.5, the mean number of basic words for Quartile 1 in Grade 1 was about 13,000; for the Median, about 16,000; and for Quartile 3, about 20,000. By Grade 12 the corresponding number of words were 42,000, 47,000 and 51,000.

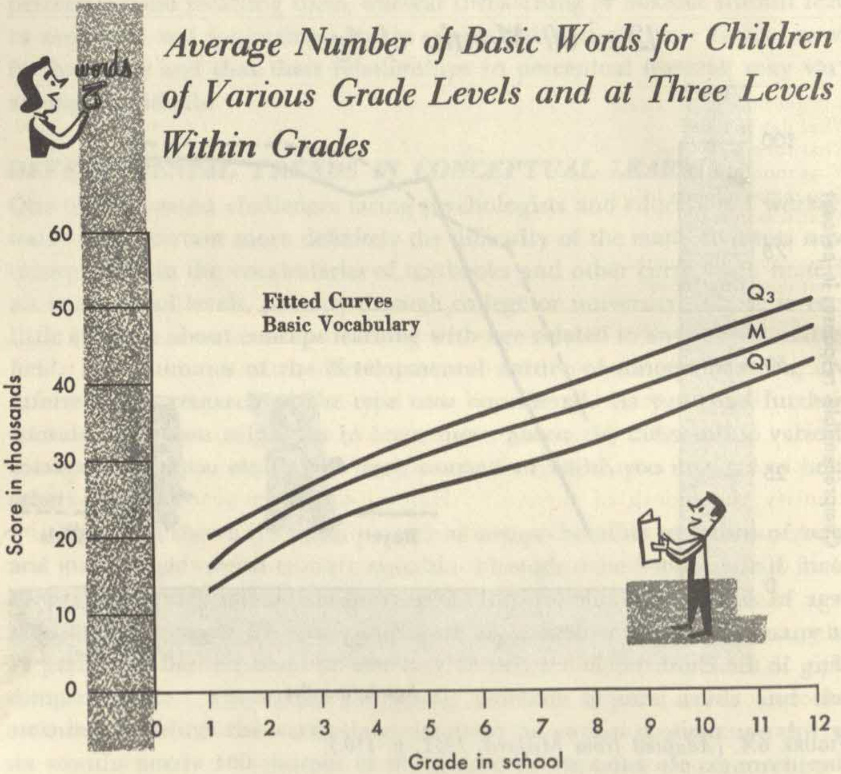


FIGURE 6.5. *(Adapted from Smith, 1941, p. 338.)*

The Millard and Smith studies show the developmental trend in vocabulary development. One infers that increasing maturation and experiences in and out of school lead to the formation of more concepts and to deeper meanings associated with the various concepts. Other researchers have identified developmental trends related to more specific concepts, and their work is discussed in the next paragraphs.

Among the most reliable studies concerning concepts of time and space in children is one by Ames (1946). A number of questions about time were formulated. These questions were then posed to six to twenty boys and girls at age levels two and one-half to four years, to ten children at age five, and to six children at ages six, seven, and eight. Though this is an exceedingly small number of cases, the information was gathered reliably and is one of the best estimates of development of the time concept. Table 6.1 shows the percent of children answering correctly questions dealing with days, hours, months, seasons, and year. At two and one-half years no child responded correctly as to whether it was morning or afternoon, whereas 100 percent did so at age seven. Not until eight years of age did all the children answer correctly concerning the day of the week. At seven years of age all could tell time as measured by the clock. Not even at eight years of age did all the children correctly identify the month of the year. Half of the seven-year-olds knew how many minutes in an hour, and about two-thirds of the eight-year-olds did. Half of the seven- and eight-year-olds correctly identified the season of the year. As shown in Table 6.1, only 50 percent of the eight-year-olds gave an adequate explanation of time as an abstraction. All questions were such that, if the child responded correctly, it was assumed he had a satisfactory concept of such terms as morning, Tuesday, January.

TABLE 6.1. Percentage of Children Answering Correctly Questions Dealing with Day, Hour, Month, Season, Year

Question	2½ Yrs.	3 Yrs.	3½ Yrs.	4 Yrs.	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.
Is it morning or afternoon?	0	40	15	71	90	84	100	100
What day is today?	10	5	5	26	70	48	84	100
What time is it?	0	0	0	7	0	32	100	100
What month is it?					30	33	84	66
How many minutes in an hour?					0	0	50	66
What season is it?					0	16	50	50
What year is it?					30	16	33	84
What day of the month?					0	0	0	66
What does time mean?					20	0	16	50

SOURCE: *Ames, 1946, p. 104.*

An analysis of arithmetic textbooks and curriculum guides shows that pupils are expected to acquire concepts about liquid measurement as shown in Figure 6.6 (Klausmeier, 1956, p. 324). In the early primary grades they learn to call correctly pint, quart, and gallon and recognize the different sizes. Informally, in Grades 2 and 3, they learn how to change the measures into larger and smaller parts; for example, that 2 pints make 1 quart and that 4 quarts make 1 gallon. Depending upon the particular school system and the textbook used in the third or fourth grade, children learn that 1 pint is the same as ½ quart and that 1 quart is ¼ gallon. Not until about fifth or sixth grade do they learn the meaning of a decimal fraction or the concept of adding liquid measures as denominate numbers. Unless children are taught specifically the meaning of decimal fraction and denominate numbers, most seem not to learn it independently in home and neighbor-

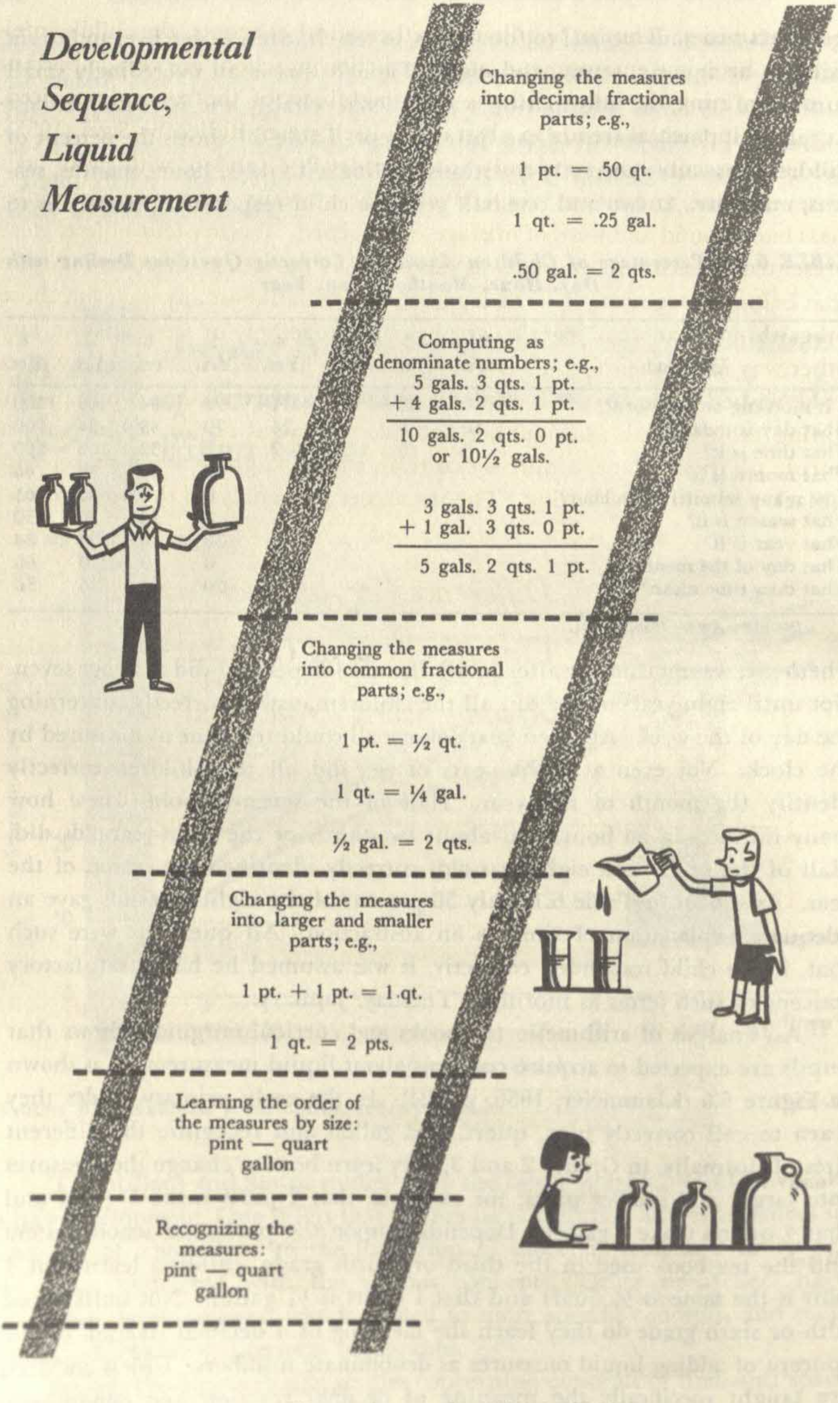

Developmental Sequence, Liquid Measurement
Changing the measures into decimal fractional parts; e.g.,
1 pt. = .50 qt.
1 qt. = .25 gal.
.50 gal. = 2 qts.
Computing as denominate numbers; e.g.,
5 gals. 3 qts. 1 pt.
+ 4 gals. 2 qts. 1 pt.
10 gals. 2 qts. 0 pt.
or 10½ gals.
3 gals. 3 qts. 1 pt.
+ 1 gal. 3 qts. 0 pt.
5 gals. 2 qts. 1 pt.
Changing the measures into common fractional parts; e.g.,
1 pt. = ½ qt.
1 qt. = ¼ gal.
½ gal. = 2 qts.
Changing the measures into larger and smaller parts; e.g.,
1 pt. + 1 pt. = 1 qt.
1 qt. = 2 pts.
Learning the order of the measures by size:
pint — quart
gallon
Recognizing the measures:
pint — quart
gallon

FIGURE 6.6. *(Adapted from Klausmeier,* et al., *1956, p. 324.)*

hood activities. Thus in acquiring mathematical concepts, the child's intelligence, his home environment, and instruction in school are very important in determining the order and the meaningfulness of the concept acquired.

Developmental trends in abstraction itself were studied by Sigel (1953). He chose twenty boys randomly from Grades 2, 4, and 6, with mean ages of seven, nine, and eleven, respectively. These twenty boys were of middle-class background and were of average intelligence. Twenty-four objects were presented to each boy, and he was asked to put the things together in a pile that belonged together, or went together, or were alike in any way, and those other things that went together, or belonged together, or were alike in any other way in another pile. He was told also that he could make as many piles as he wished. The objects included a red plastic office chair, a white plastic dining table, a flesh pink rubber baby doll, a metal boy in a blue suit, a purple plastic airplane, a blue metal train engine, a green wood snake, and a black and white plastic dog. The researcher first analyzed the boys' group-

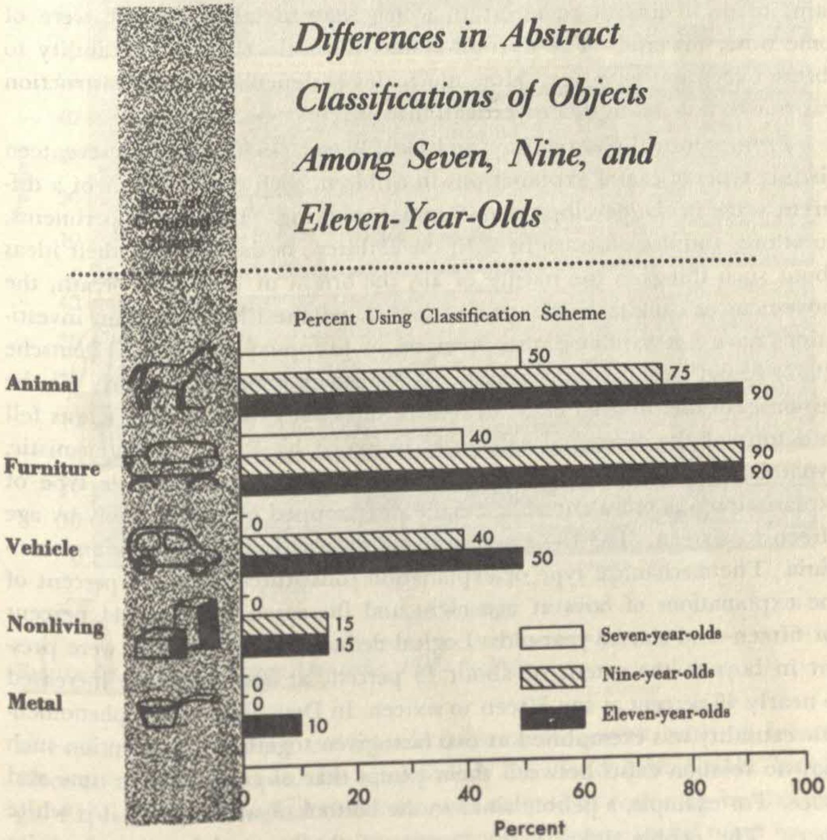


FIGURE 6.7. *(Adapted from Sigel, 1953, p. 138.)*

ings as organized on such perceptual bases as feelings of the child toward the object, use of the object, and identity of structure or function of various objects. The researcher then rearranged the objects and had the boys put together animals, furniture, vehicles, nonliving things, and things made of metal; this required a higher level of abstraction. Figure 6.7 shows the differences in the abstract classification of the objects among the boys at the three age levels. Fifty percent of the seven-year-olds, 75 percent of the nine-year-olds, and 90 percent of the eleven-year-olds properly put together all the objects which were animals; and the percents for the same age groups for arranging furniture were 40, 90, and 90, respectively. None of the seven-year-olds, 40 percent of the nine-year-olds, and 50 percent of the eleven-year-olds properly put "vehicle" objects together. The concept of nonliving was not yet generally acquired, and only 15 percent of both the nine- and eleven-year-olds grouped objects together that were nonliving. The researcher pointed out, however, that the test of the last concept, "metal," may have been unfair in that the toys were painted and the paint made it difficult to ascertain which were metal and which were of some other material. The over-all results show clearly that the ability to abstract increases with age. How much this is dependent upon instruction was not considered in this investigation.

From informal observations and tests, Piaget (1930) classified seventeen distinct types of causal explanations in children, each characteristic of a different stage in the development of causal thinking. Through experiments, questions, and demonstrations with the children, he investigated their ideas about such things as the nature of air, the origin of wind and breath, the movement of clouds, the floating of boats, and the like. American investigators have not validated the progressions proposed by Piaget. Deutsche (1937) found very different results. As shown in Figure 6.8, nearly all the responses of the children eight to sixteen years of age to Deutsche's tests fell into four of the seventeen categories proposed by Piaget: phenomenistic, dynamic, mechanical, and logical deduction. The phenomenistic type of explanation was prevalent at age eight and dropped off considerably by age fifteen to sixteen. The dynamic explanation was low at all ages and constant. The mechanical type of explanation constituted about 37 percent of the explanations of boys at age eight and increased to about 44 percent for fifteen- and sixteen-year-olds. Logical deduction explanations were present in boys to the extent of about 13 percent at age eight and increased to nearly 40 percent at age fifteen to sixteen. In Deutsche's study, phenomenistic causality was exemplified as two facts given together in perception such that no relation exists between them except that of continuity in time and space. For example, a pebble sinks to the bottom of water (fact); it is white (fact). The pebble sinks to the bottom of the water *because* it is white (phenomenistic causality). There is no concept of relationship. Dynamic causality was defined as without animism but with forces in the object that are capable of explaining its activity and movement; for example, clouds move across the sky, not because they are alive (animism gone), but because something in the cloud pushes them. Mechanical causality was indicated as explaining by contact and transferrence of movement, with no internal force at all; for example, the wind pushes the cloud; pedals make bicycles go. Explanation by logical deduction was defined as reasoning by the principle; for example, water flows into the second of the connected tubes because water can go equally well in both directions. In logical deduction the in-

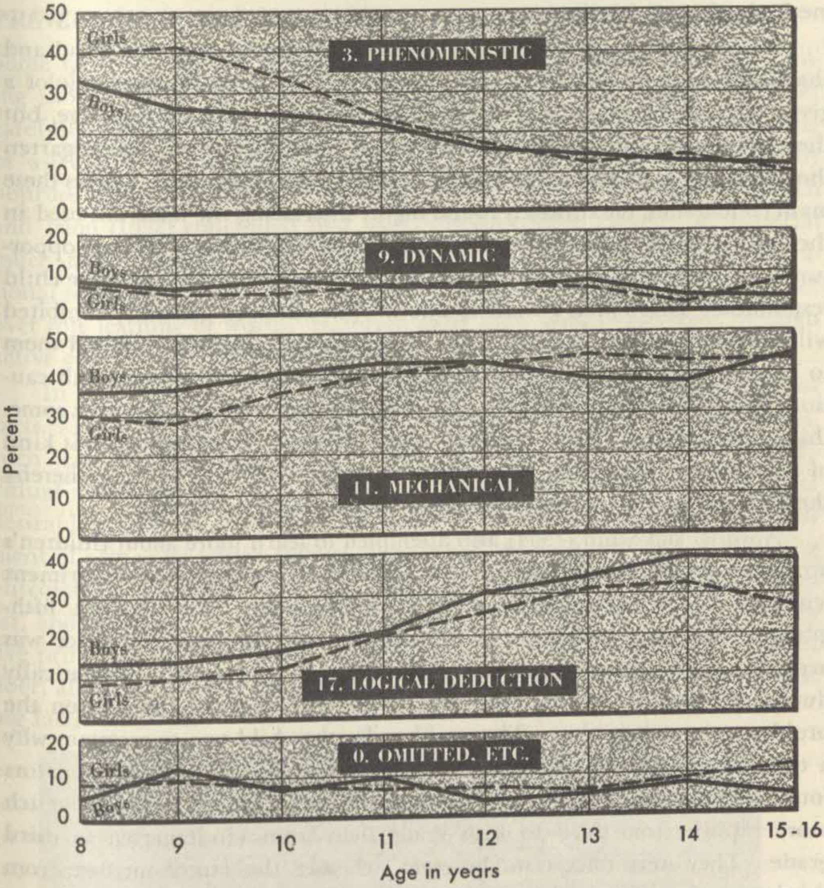

Children's Concepts of Causal Relations

FIGURE 6.8. *(Adapted from Deutsche, 1937, p. 36.)*

dividual uses such concepts as density and weight. Deutsche concluded that all evidence from this study did not warrant classifying causal reasoning into stages according to the age or maturational level of the child. Though not shown in Figure 6.8, there was a great deal of overlapping among the children at the various ages in the use of each of the four bases of causal relations. Deutsche concluded that the means of seeing causal relations or abstracting is continuous and that school experience is an important determiner not only of the concepts acquired by the children but also of their means or methods of acquiring them.

Oakes (1947) also found that Piaget's classifications were not useful and that there were no definite stages in children's thinking characteristic of a given age. Understanding of essential relationships increased with age, but there were also large individual differences; some children in kindergarten showed better understandings than did others in the sixth grade. Besides these main conclusions, the children found highly interesting the materials used in the experiment and the many science concepts which they had not had opportunity to study in class. In many cases when the question was asked, the child responded, "That's what I want to know." The children generally exhibited willingness to revise a concept when observational experience showed them to be erroneous. Further, children often approached the answers with caution; that is, they were willing to suspend judgment and did not think something was necessarily right or wrong. Oakes strongly recommended this kind of approach to instruction in science rather than the drill of facts whereby the child thinks that something is always either right or wrong.

Ausubel and Schiff (1954) also attempted to learn more about children's acquiring causal relationships. They conducted an excellent experiment with sixty-six kindergartners, sixty-six third-graders, and sixty-six fifth-graders. An actual problem-solving situation involving a teeter-totter was arranged, with relevant cues and irrelevant cues introduced systematically during the problem-solving situation, to find the effect of the cues on the problem-solving behaviors. The problem for the child was to ascertain why a teeter-totter operates as it does—a causal relationship. The investigators found that the ability to learn a relevant causal sequence increased much more rapidly from third to fifth grade than from kindergarten to third grade. They were uncertain, however, whether the larger increase from third to sixth grade could be interpreted as a more rapid growth in reasoning ability or whether it came about from increased incidental experience with teeter-totters.

At present we are in the position of using relatively small bits of information of the kind in the researches just discussed to make decisions about many important characteristics of concept learning in children of various ages. We conclude that with increasing age there is increasing ability to discriminate, to abstract, and to form more meaningful concepts. We also know that there is wide variability in children of the same chronological age in these abilities. We do not know the extent to which schooling determines the concepts acquired by children and their methods for acquiring them. In a later section of the chapter the principles for facilitating concept learning are based on observations by the author and results from research of the type reported which suggest that the school has an important task, not only in deciding which concepts are to be learned, but also in helping learners acquire better methods for learning concepts.

PRINCIPLES FOR FACILITATING THE LEARNING OF FACTS

Some facts can best be acquired by rote learning; however, concept learning should not be by rote. This means that the teacher should consider carefully whether the material to be learned by pupils is devoid of meaning or whether it has inherent meaning which can and should be acquired by nonrote methods. After an extensive review of the literature, McGeoch and Irion (1952) concluded that human beings learn meaningful material much more efficiently than nonmeaningful material and that in educational settings the acquisition of meanings does and should take precedence over rote learning of words. However, some facts must be acquired through active effort on the part of the learner.

In this section dealing with principles for facilitating the learning of facts, as in later sections devoted to principles related to other outcomes, such learning conditions as motivation, transfer, and provision for individual differences are not discussed. Principles related to these and other desirable conditions of learning are given in Chapters 11 to 14. In the statement of principles which follows, as in others dealing with specific learning outcomes, it will be assumed that adequate conditions of motivation, transfer, and provision for individual differences are operative. In the following five principles for facilitating the learning of facts the teacher is the implied doer; all except 3 and 5 could be carried out by the reader himself in acquiring facts:

1. Organize factual material into appropriate learning units.
2. Secure the correct response on the first try.
3. Reinforce correct responses; correct errors immediately.
4. Practice and review until the facts are firmly established.
5. Aid the learner to evaluate his own responses.

1. Organize Factual Material into Appropriate Learning Units

Suppose that a high school student wants to learn the names of the bones of the body. How difficult is this task for him? How much time will be required for the learning? Stated differently, what is the length of the learning task? Can this task be organized on some basis whereby only several portions of related facts in the total group can be mastered efficiently and then combined? Difficulty, length, and relationships among parts of a larger body of factual material are three dimensions to consider when organizing factual material into appropriate learning units.

The names given to the some two hundred bones of the body are not easy to learn and are not frequently encountered in normal conversation or reading. If the high school student were simply presented an alphabetized list of the bone names, he would probably find this an exceedingly difficult learning task. But several relationships can be found for grouping the bone names. For example, the bones of the head, neck, and trunk can comprise one group or three related groups. The bones of the arms and hands can comprise another group, and of the legs and feet another. Since sixty-four of the two hundred bones are in the hands and arms alone and have a relatively small number of names, such a grouping of related facts makes the total learning task easier than does using the alphabetized list.

Though it may appear trite or common sense to suggest that related grouping of facts facilitates acquisition, many vocabulary lists are presented to pupils in the elementary grades and high school as alphabetized lists to be learned more as facts than as concepts. The following is an actual vocabulary list presented to sixth-grade children as one part of many units for the year in social studies: *adapt, archeologist, domesticate, flint, glacier, government, Ice Age, Lake Dwellers, metals, nomad, pottery, property, Stone Age, tools,* and *tribe.* In another single assignment to be accomplished in two short study periods in school with homework, the same sixth-grade children were supposed to learn all the names of the countries of the Near East, the capital of each country, and the main seaport of countries which had seaports. No organizational scheme was presented by the teacher to help the pupils acquire these facts. Those pupils who acquired them did so through rote memory of facts quite as meaningless as the nonsense syllables which earlier experimenters have used as the basis for showing that the difficulty, length, and organization of material vitally affects its efficient acquisition. Some of that research will now be discussed.

Figure 6.9 shows the increase in time per item to memorize digit lists of increasing length. When an individual is presented with a longer set of facts that he cannot immediately master, the time for acquiring each additional fact goes up markedly. As shown in Figure 6.9, the rate of increase of time per item varies in different series of nonsense material, but in general the time to learn each item in the longer list increases as the square root of the number of items. The time per list can be found from the graph by multiplying the time per item by the number of items. The curves are for four individuals, the top two curves being for the same individual under massed and distributed practice. Though the above statements are based on experimentation with almost totally meaningless material, repeated observation of children's learning in school suggests that one of the primary difficulties which children experience in learning to spell is that they are presented with too many words at a time, few of which they learn well. And the same is true of addition, subtraction, and multiplication facts.

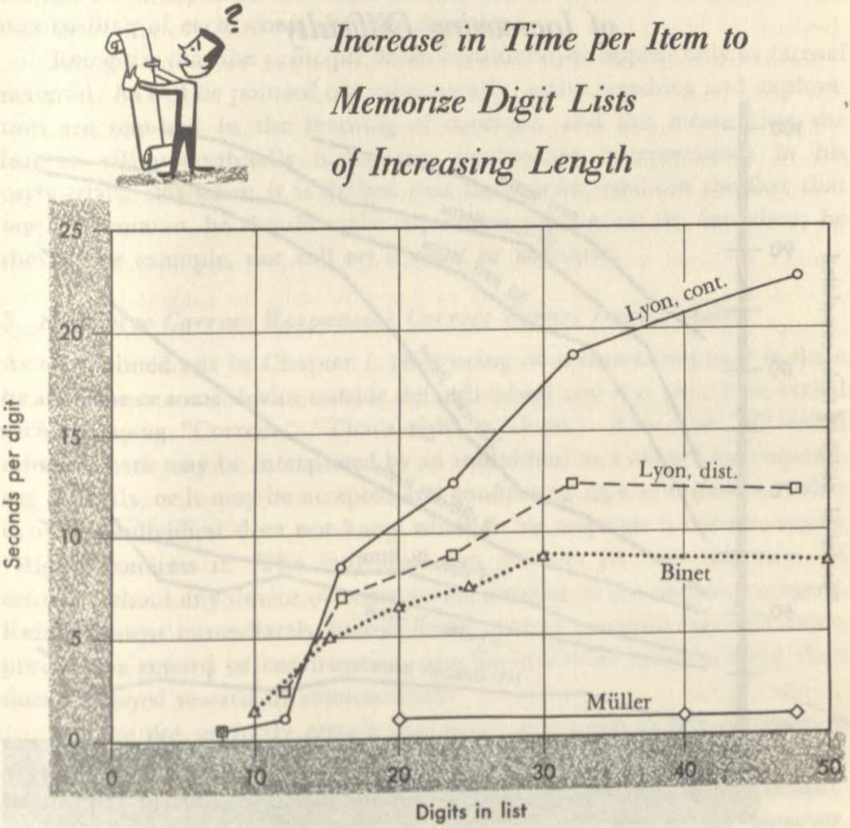
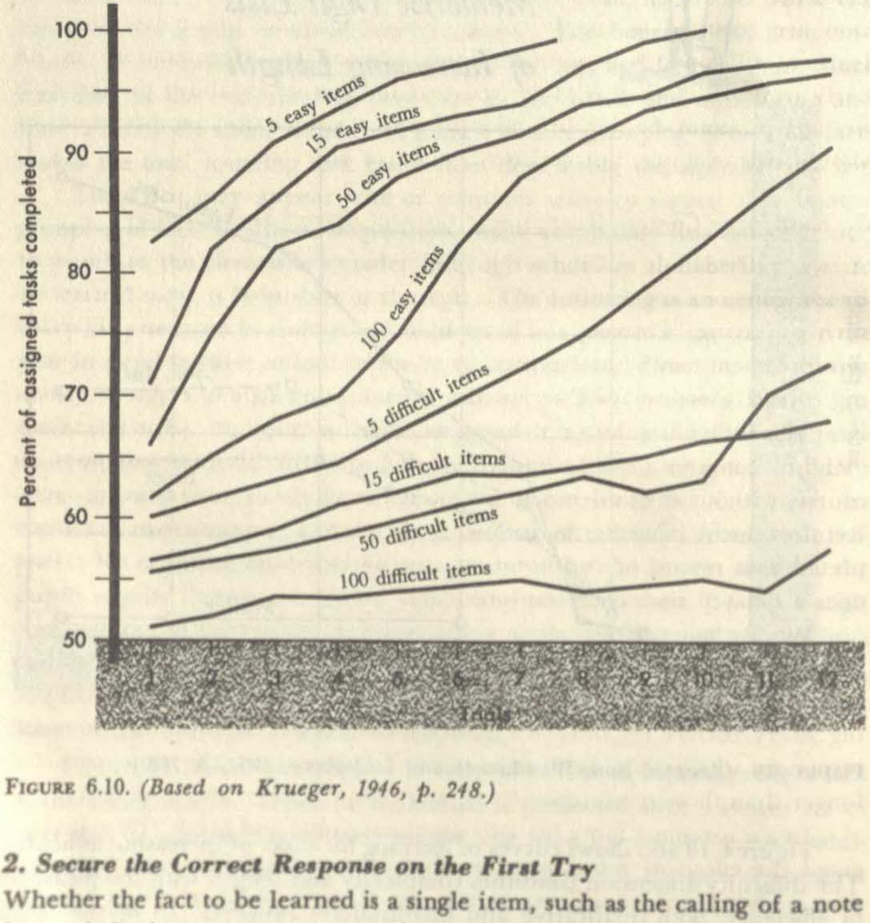


FIGURE 6.9. *(Adapted from Woodworth and Schlosberg, 1954, p. 706.)*

Figure 6.10 also shows curves of learning for tasks of increasing difficulty. The difficulty dimension combines complexity and length with the measures of efficiency, both qualitative and quantitative; however, all of the items are of the nonsense syllable type. All of the easy items are learned in fewer trials than are the difficult items. The easy items show a rapid increase from first to third trial, and then less rapid. The learning of difficult items is very slow at first, gradually accelerating.

At all school levels and with learners of varying ability to memorize, an important task of the teacher is to ascertain the difficulty and length of the factual material to be learned. The judicious teacher does a considerable amount of trying and confirming in order to find out facts of appropriate difficulty for the learners; just as if he himself decided to acquire a body of factual information, he generally proceeds on a trial-and-confirmation basis to ascertain the best organization and grouping.



Curves of Learning for Tasks of Increasing Difficulty

FIGURE 6.10. *(Based on Krueger, 1946, p. 248.)*

2. Secure the Correct Response on the First Try

Whether the fact to be learned is a single item, such as the calling of a note in music by its correct name, or of a method, such as the order of adding ingredients in making a cake, the first response should be the correct one. Any time an error is made, the possibility for accepting the error as correct exists. Also, the incorrect response will have to be eradicated. When a teacher works with one child at a time, it is relatively easy to make certain that the first response is the correct one. When working with a group there is a tendency to present the factual material to the class as a group and accidentally to permit many children to make incorrect responses. A typical procedure in spelling, for example, is to dictate the word list to all the children early in the week. Some make many errors on the first attempt; others make few or no errors. Although this may be unavoidable, the teacher should assuredly go through the list with the entire class to make certain that every error made is corrected and that each child gets the correct spelling of each word after the dictation.

Recognize that the principle under consideration applies only to factual material. As will be pointed out subsequently, active searching and exploration are required in the learning of concepts, and this means that the learner will undoubtedly make some inadequate interpretations in his early trials. But when it is desired that the learner establish the fact that *my* is a pronoun, he should make the correct association the first time; he should, for example, not call *my* a noun or adjective.

3. Reinforce Correct Responses; Correct Errors Immediately

As was pointed out in Chapter 1, reinforcing of a correct response is done by someone or some device outside the individual and may simply be verbal such as saying "Correct," "That's right," "Good." This form of verbal reinforcement may be interpreted by an individual as a reward for responding correctly, or it may be accepted as a confirming type of experience; that is, if the individual does not know whether his response is correct, saying "Right" confirms it. The individual can confirm his own responses, of course, without any device or other person serving as the reinforcing agent. Reinforcement immediately following the correct response, whether interpreted as a reward or confirmation, usually facilitates learning more than does a delayed reward or reinforcement.

We are not perfectly certain that every successive correct response to the same stimulus should be reinforced. In highly controlled laboratory situations, Humphreys (1939) and Grant *et al.* (1951) found that reinforcing every correct response led to somewhat better acquisition; however, responses which were reinforced only 25 percent of the time persisted longer than those reinforced 50, 75, and 100 percent of the time.

In a classroom, a more realistic situation, Auble and Mech (1953) investigated the effects of variable ratios of reinforcement with third-grade children. They found no difference in either acquisition or retention between 100 percent reinforcement and 50 percent reinforcement. Beyond this, they noted that children not selected to receive reinforcements but in the same classrooms learned and retained about the same as those who received the variable reinforcement schedules. They concluded that correct responses should be reinforced at reasonable intervals by the teacher but that not all children's responses need be reinforced 100 or even 50 percent. Children whose responses were not directly reinforced profited from simply being aware of the reinforcements through listening, apparently using them as confirmatory experiences.

B. F. Skinner* (1955) made a most positive and emotional case for reinforcement theory to be applied to education. His most serious criticism of current classroom learning is that correct responses are too infrequently reinforced, the idea being that a teacher with thirty or more pupils cannot possibly reinforce a sufficient number of correct responses of all the pupils to ensure efficient learning. He further believes that a large portion of classroom learning is or should be of factual material. If large numbers of teachers rely primarily on rote methods to teach children important concepts as well as facts, Skinner's criticism is probably valid.

Skinner's research on reinforcement schedules in training animals has led to great improvement in the performances of many lower forms of animals, and subsequent research has shown that college students and children in the elementary grades can acquire facts by using teaching machines. The possibility is great for improving factual learning and some cognitive and psychomotor skills through the use of machines as aids for teaching. At present, however, we cannot reliably estimate the extent to which learners, trained with machines that determine both what is to be learned and how often the correct responses are to be reinforced or rewarded, can become creative individuals who decide for themselves what to learn, how to learn it most efficiently, and how to produce their own ideas and inventions.

Despite the preceding questions about the desirability of extensive use of teaching machines until more research has been completed, the importance of reinforcing correct responses to condition persons to make certain responses is well established. The converse, punishing for incorrect responses, has not been finally verified. Punishment keeps the individual from repeating an activity or response only if the punishment is more unpleasant than the activity is pleasant. Also, an incorrect response followed with a punishment may be interpreted to mean that the response is incorrect, but it does not help the person know what the correct response is. When a learner desires to acquire the correct response, it is important, not only to let him know that his response is incorrect, but also to help him make or learn the correct one. Not only with factual material such as is being discussed, but with motor skills and in the initial stages of concept formation, it is essential that when the learner makes an incorrect response or uses an inappropriate method the teacher should help him in learning the correct response or the better method. It is at this point, perhaps, that the greatest improvement in the development of all human abilities can be made. Millions of children in school from kindergarten through college and university sincerely desire to learn. They meet obstacles; they know their methods or responses are not correct; but too often the teacher does not have time to help them acquire the correct response or methods. Frustrated and without help, some give up their efforts.

4. Practice and Review Until the Facts Are Firmly Established

A fact or (usually) a series of facts is by definition underlearned when it cannot be brought up to a criterion of one perfect recitation or response and overlearned when practiced after one perfect recitation has been made. For overlearning to operate effectively, the repetitions must be carried out with intent to learn; mere repetition in itself does not constitute overlearning. Though all meaningless material is forgotten rapidly after it is acquired, that which is overlearned is remembered longer, as shown in Figure 6.11. With 100 percent overlearning–repeating the learning of the material as long as was taken originally to acquire it–retention seven days later and thereafter was somewhat better than with 50 percent overlearning and far better than with no overlearning.

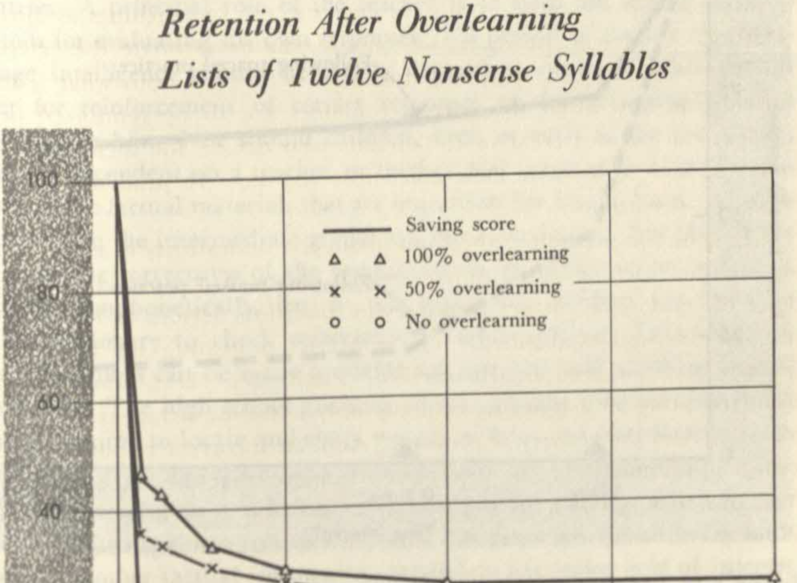


FIGURE 6.11. *(Based on Krueger, 1929, p. 75.)*

To prevent the large degree of forgetting of nonsense material, it must be recited, practiced, or somehow reviewed. Figure 6.12, from Cain and Willey (1939), shows the curves of retention obtained from recall of nonsense syllables by distributed and massed practice. Seven days after the distributed practice had stopped, approximately 70 percent of the nonsense syllables could be recalled, whereas when all the practice was at one time (massed), only about 25 percent could be recalled. Results of experimentation such as that shown in Figure 6.12 has led to more careful scrutiny of the spacing of review for many kinds of factual verbal material, including spelling.

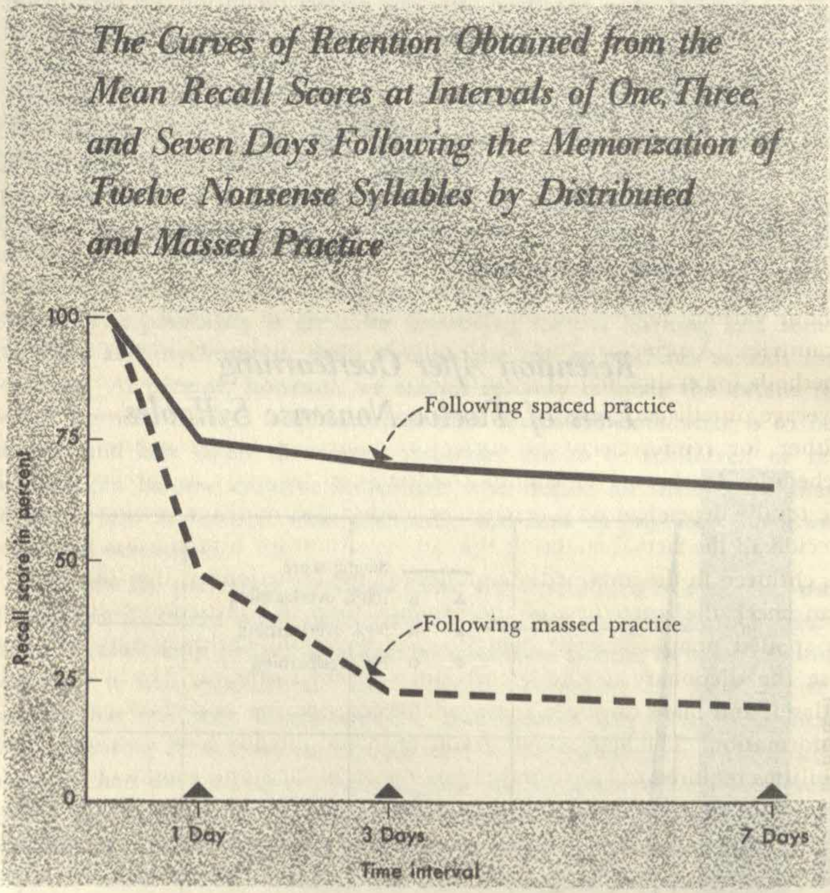

The Curves of Retention Obtained from the Mean Recall Scores at Intervals of One, Three, and Seven Days Following the Memorization of Twelve Nonsense Syllables by Distributed and Massed Practice

FIGURE 6.12. *(Adapted from Cain and Willey, 1939, p. 211.)*

Modern investigators accept the general results as shown in Figure 6.11 and 6.12 and are attempting to ascertain why it is, for example, that distributed practice leads to better retention than massed practice. After a series of comprehensive investigations, Underwood (1957) found no adequate explanation. He did, however, come to the same conclusion, namely, that distribution of practice of verbal material leads to better acquisition and recall than does massed practice.

In all the research reported above, it should be remembered that nonsense material of very low, if any, meaning was used and that the learning tasks were relatively short. In the typical laboratory experiment the rest interval between successive learning trials is as short as one minute and is seldom over five minutes. This permits, within a short time period, several consecutive trials with short rest intervals (distributed practice) and also permits a relatively short time to be given to one massed practice session. Further discussion of amount and distribution of practice is given in Chapter 12.

5. Aid the Learner to Evaluate His Own Responses

Again turn to classroom learning of factual information such as the correct spelling of words, the correct pronunciation of words, specific information about various objects and phenomena, the location and size of cities and countries. A principal role of the teacher is to help the learner develop methods for evaluating his own responses. No person of average or above-average intelligence should be totally dependent on some other person either for reinforcement of correct responses or for arranging practice schedules for him. Nor should children, even as early as the first grade, be totally dependent on a teacher, or teacher and machine combination, to decide all the factual materials that are important for him to learn. As soon as children in the intermediate grades can use a dictionary, they themselves can check the correctness of the pronunciation of words; unless the word is spelled nonphonetically, ten- to twelve-year-old children can learn to use the dictionary to check correctness of their spelling. Encyclopedias, atlases, and maps can be made available for securing and checking factual information. The high school graduate should already have developed the abilities required to locate and check sources of facts and considerable independence in deciding which facts are important for him to learn.

Before turning to a discussion of principles in concept learning, the reader is invited again to consider seriously the more specific arbitrary associations and other factual information related to his major field of interest which can best be acquired through following principles such as those discussed above. The number of facts which are known to mankind staggers the imagination. To acquire even a small percent of this total factual information, most human beings would spend vast amounts of time daily in memorizing and overlearning. Therefore, those essential facts needed to acquire broader concepts and problem-solving abilities to deal adequately with the physical and social world should be given most attention throughout formal schooling. As the person at any time in life needs further factual information to deal with his physical and social world effectively, he should have acquired the broad concepts and problem-solving skills whereby he can secure needed facts himself.

PRINCIPLES FOR FACILITATING THE LEARNING OF CONCEPTS

Words and other symbols can enable individuals to communicate with each other, but spoken words are only auditory stimuli and written symbols are only visual stimuli until the individual discriminates and associates meanings with them. Concepts, whether single terms, principles, or generalizations, are among the most important outcomes of learning in school. They are indispensable for the transmission of man's previous experiences, interpreting present situations, and projecting behaviors and plans into the future. Most concepts are not finally acquired the first time the terminology or related experience is encountered. Instead, many concepts at first carry relatively little meaning, but this meaning broadens as the individual has increasing experiences both with the terminology and with the actual qualities or things for which the concept stands. The child's concept of man, for example, expands in a spiraling fashion until it reaches varying degrees of completeness among individuals. Further, the nature of man is yet being investigated and may change markedly if other manlike creatures are found elsewhere than on earth. This and other characteristics of concept formation will be clarified further in the discussion of six principles:

1. Organize concepts into appropriate learning units.
2. Encourage and guide searching behavior.
3. Organize realistic experiences with the concept.
4. Give concise, clear meanings of the concept.
5. Provide for applications of the concept.
6. Aid the learner to evaluate the adequacy of his concepts.

1. Organize Concepts into Appropriate Learning Units

This principle applies to all outcomes of learning which are treated in this and the next four chapters and will not be discussed in remaining chapters. The same dimensions of difficulty, length, and relationships discussed about the learning of facts also apply to the learning of concepts. Some idea of these dimensions as applied to concepts can be gained by examining English dictionaries intended for use at the various school levels. Dictionary publishers have tried to set up one level for elementary grades, another level for high school, another for college level, along with the unabridged form and various thesauri. The definitions of the terms in the dictionaries of different levels suggest appropriate meanings of terms for students at each level.

COMPARATIVE ENTRIES FROM FOUR DICTIONARY LEVELS

Thorndike-Barnhart Beginning Dictionary[a]	Thorndike-Barnhart Advanced Junior Dictionary[b]	Webster's New Collegiate Dictionary[c]	Webster's New International Dictionary of the English Language[d]
nag	nab	nab	nab
naiad	nabob	nabob	Nabal
nail	nacelle	Naboth	Nabaloi
naked	nacre	nacelle	Nabataean
nakedness	nadir	nacre	nabber
name	nae	nadir	nabk
nameless	nag	nae	nabla
namely	Nagasaki	naevoid	nabob
namesake	Nagoya	nag	nabobery
nap	Nagpur	nagana	nabobess
cloud (kloud), 1. a white or gray or almost black mass in the sky, made up of tiny drops of water: *Sometimes when it rains, the sky is completely covered with dark clouds.* 2. a mass of smoke or dust in the air. 3. cover with a cloud or clouds. 4. grow cloudy: *The sky clouded over.* 5. anything like a cloud: *a cloud of arrows, a cloud of birds in flight.* The dark veins in marble are sometimes called clouds. We may speak of a person as being under a cloud of disgrace or suspicion. 6. make dark; become gloomy: *His face clouded with anger.*	**cloud** (kloud). 1. a white, gray, or almost black mass in the sky, made up of tiny drops of water. 2. mass of smoke or dust. 3. cover with a cloud or clouds. 4. grow cloudy: *The sky clouded.* 5. a great number of things moving close together: *a cloud of birds, a cloud of arrows.* 6. streak; spot: *clouded marble.* 7. anything that darkens or dims; cause of gloom, trouble, suspicion, or disgrace. 8. darken; dim; make or become gloomy, troubled, suspected, or disgraced. 1,2,5-7 *n.*, 3,4,6,8 *v.* —**cloud′like′**, *adj.*	**cloud** (kloud), *n.* [AS. *clūd* rock, hillock.] 1. A visible mass of fog or haze suspended at a height in the air. See CIRRUS, CUMULUS, NIMBUS, STRATUS. 2. In general, a visible mass of particles in the air or in a gas; as, a *cloud* of smoke or of dust. 3. A great crowd or multitude. 4. That which has a dark, lowering, or threatening aspect. 5. A dark or opaque vein or spot, as in marble; hence, a blemish or defect. —*v. t.* 1. To overspread with a cloud or clouds. 2. To darken or obscure; hence, to render gloomy or sullen. 3. To blacken; sully; — esp. used of reputation. —*v. i.* To grow cloudy. — **cloud′less**, *adj.*	**cloud** (kloud), *n.* [ME. *cloud*, *clud*, rock, hill, cloud, fr. AS. *clūd* rock, hillock; akin to E. *clod;* basic idea: mass, cumulus. See CLOD.] 1. A visible assemblage of particles of water or ice, formed by the condensation of vapor in the air; a fog or mist or haze suspended, generally at a considerable height, in the air; also, the material of which these masses are composed. See CIRRUS, CUMULUS, NIMBUS, STRATUS. 2. **a** In general, a visible assemblage of particles in the air or in a gas; as, a *cloud* of smoke or of dust. **b** One of the aggregations of obscuring matter in space which reveal themselves as dark areas against the background of more distant bright objects or by stationary lines in stellar spectra. **c** A flying swarm, as of birds or locusts. 3. A great crowd or multitude; a vast collection. "So great a *cloud* of witnesses." *Heb.* xii. 1. 4. That which has a dark, lowering, or threatening aspect; that which temporarily overshadows, obscures, or depresses; as, a *cloud* of sorrow; a *cloud* of war. 5. A dark or opaque vein or spot on a lighter or transparent material, as in marble; a similar spot of any shade or color against a different ground; hence, a blemish or defect.

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[a] From *Thorndike-Barnhart Beginning Dictionary* (Revised and Enlarged). Copyright © 1959, 1952 by Scott, Foresman and Company, Chicago.

[b] From *Thorndike-Barnhart Advanced Junior Dictionary*. Copyright © 1957 by Scott, Foresman and Company, Chicago.

[c] By permission. From *Webster's New Collegiate Dictionary*, copyright, 1959, by G. & C. Merriam Co., publishers of the Merriam-Webster dictionaries.

[d] By permission. From *Webster's New International Dictionary*, Second Edition, copyright, 1959, by G. & C. Merriam Co., publishers of the Merriam-Webster dictionaries.

2. Encourage and Guide Searching Behavior

This principle can be inferred from the research already cited but is also strongly supported by other well-conducted investigations. Butler and Harlow (1957) reported that rhesus monkeys in the presence of visual stimuli and in the absence of any form of reward or reinforcement explored their environment. The monkeys actively searched not for a reward such as food but apparently from curiosity. One conclusion was that, if monkeys demonstrated exploratory or searching behavior in the absence of any form of reward or reinforcing agent, certainly human beings do also. Most child psychologists and educators had already concluded the same about children (in the absence, however, of carefully controlled experimentation).

Della-Piana (1957) set up an inductive concept formation experiment in which one group of human subjects was asked to identify and subsequently define certain concepts. The individuals who were encouraged to search learned significantly more definitions than did the second group who were simply told that they had correctly defined the concept under investigation. Two other experiments are now reported which suggest not only the importance of encouraging searching behavior but also of guiding it.

Kittell (1957) divided sixth-grade pupils into three groups. Unequal amounts of direction during the learning of specified principles were given to the three groups. One group was given no information; another group was given sufficient information to allow them to identify the underlying principle; the third group was given all the information needed, including the statement of the principle by which a series of facts could be brought into proper relationship. Immediately after the learning activity and again four weeks later, the middle group was superior to the other two groups, and the group with all the information achieved and retained better than the group with no information. The children to whom all the information was given apparently accepted it as facts to be learned or somehow mastered the relationship between the principle and the facts by a sort of a rote process. The middle group, on the other hand, actively searched and, in the process, acquired a better understanding of the concept and retained the principle better. Craig (1956), using sophomores and juniors enrolled in college, similarly found that the group which was helped to find relationship in the form of principles did better than the group which was not given this help.

The teacher's encouraging a questioning or searching attitude on the part of the learners to acquire new concepts and to broaden partially developed concepts is essential to the improvement of cognitive processes and abilities. We simply cannot organize concepts as facts to be memorized and expect this to have marked influence on any human abilities, except perhaps memory and speech. Further, when students are to learn particular generalizations or principles, the teacher must find a balance between giving too much information, so that the learner loses the opportunity for searching, and insufficient information, so that the learner does not acquire sufficient meanings. In Chapter 1 we saw that the teacher's role in purposeful learning situations is to help the learner make provisional tries which lead to the goal—in the case of concept learning, a new concept or better meaning of the concept. How much, how little, and when to help the learner must be based upon observations and judgments in the immediate teaching–learning situation.

3. Organize Realistic Experiences with the Concept

Suppose that students in an educational psychology class should extend their concept of "teaching–learning situation." How could an instructor be relatively certain that the individuals would develop a fairly adequate concept? Three means could be used. One is for the instructor to describe a number of teaching–learning situations orally or refer the individual to printed descriptions. A second is to show teaching–learning situations in flat pictures, in sound films, or by television. A third is to arrange for the students to observe and participate in a number of ongoing classroom situations in one or two schools. Similarly, if a primary school teacher desires young children to understand the term "animal," realistic experiences with a number of different animals are arranged; pictures and other visual presentations of animals not immediately available for use in the classroom are used; and verbal descriptions are given. The principle under consideration proposes that realistic experiences should be arranged in both the college and primary school setting; the highest degree of realism incorporates actual experiences with whatever the concept stands for in reality.

It is generally recognized in science instruction that verbalizing in itself is not adequate for most learners to acquire concepts. Large sums of money, though not sufficient in most schools, have been spent to provide the equipment, materials, and space for conducting experiments in biology, chemistry, and physics through which learners can have realistic experiences with many important concepts. It is also recognized that every elementary classroom should have a science table and either a permanent or movable source of science supplies in order that elementary school children may acquire scientific concepts. In arithmetic also, the chalkboard and three-dimensional objects are used advantageously to help many children acquire concepts. In the social sciences, we lag in providing essential realistic experiences and other pictorial and figural representations of important concepts. We expect young children to understand somehow such terms as *prehistoric man, Ice Age, government, dictator, democracy* simply through using words in oral or written form.

Not all concepts, of course, can or should be introduced with realistic experiences. As was pointed to in a previous section, a concept is both more and less than the instances or illustrations from which it is abstracted. Most of us would agree that there should not be realistic experiences with such concepts as murder, adultery, bloodshed, and jealousy. Further, many concepts cannot be presented pictorially or with objects. For example, the parts of speech, such as noun and pronoun, cannot be depicted with concrete objects or pictorial representations. The many concepts connected with religious beliefs also probably cannot be anything more than verbalisms to which the beliefs are attached. No one has yet found a reasonable way to illustrate concretely or pictorially such things as *God, spirit, soul, eternity, omnipotent,* and *omnipresent.*

To summarize, no one can simply give to someone else a set of concepts. The individual must acquire the meanings himself. A good share of all the important concepts to be learned in school can be handled in a manner so that realistic experiences with them are arranged, representations of the properties or uses of the concept can be illustrated and applied, and a variety of experiences rather than a single rote learning experience are possible. As will now be shown, these methods in no way deny the importance of explaining the concept in words.

4. Give Concise, Clear Meanings of the Concept

How long man experienced many phenomena without developing words or other symbols to communicate his experiences is unknown. It is known, however, that children as well as adults can have many realistic experiences with other human beings without developing a good concept of man. Similarly, vacationers see all kinds of plants and trees but form only a hazy concept of tree or grass. It is not enough in the teaching-learning situation that children have fairly direct experiences with events and phenomena. The teacher must go beyond this to help them identify and clarify the meanings of these many experiences. This involves discussing and defining terms clearly. Some learning may occur simply through doing, but most learning occurs through thinking before, during, and after the doing. Simply doing or being active does not in itself assure that concepts will be formed, because most communicable experiences must eventually be symbolized clearly and concisely in language.

One of the dismaying facts about the English language is that many of its words have been in existence for centuries and their original meanings are no longer adequate because of new knowledge. In the social studies, as well as in the natural sciences, a vast confusion, sometimes referred to as a semantic problem, has arisen. This is another way of stating that we do not understand one another because we ascribe different meanings to the same words. In perhaps no field is this more apparent than in psychology. Within less than a century, "conditioning" has taken on many different meanings from that originally proposed by Pavlov. He brought about conditioned reflex responses in animals and used these data to give a particular meaning to conditioned responses. Subsequently the term *experimental conditioning* came into usage to indicate conditioning of responses other than reflex responses under experimental conditions. Still more recently, Skinner has proposed the idea of *operant conditioning*. Many writers now use "conditioned responses" to refer to any outcome of any conditioning process. When the less sophisticated reader encounters the term "conditioning," he quite reasonably does not understand what the process really is. This example suggests the importance of correct meanings in your own learning of vocabulary in this book.

A successful teacher at any school level makes certain not only that the learners have sensory experiences but that they learn to state the results in clear, concise terminology. This means that a considerable amount of time is spent in clarifying and defining vocabulary. Pupils generally characterize their best teachers as being able "to explain things clearly."

5. Provide for Applications of the Concept

A number of principles have already been stated for facilitating the learning of facts and of concepts. These principles are themselves a complex form of concepts that can serve as guides to behavior in teaching–learning situations. On the pages of this book they are merely batches of ink. If presented by an instructor orally to students, they are merely puffs of air. The reader can memorize them without getting the meaning intended. Teachers with experience can probably read both the principles and the examples, think about them, and discover where the principles would have applied in previous teaching–learning situations or where they might be applied in future situations. The students without experience as teachers will probably have more difficulty at first in getting the intended meanings and then in attempting to find applications to future teaching situations. The student without teaching experience can draw on his many experiences as a student. But an instructor can take some definite steps to help prospective teachers in finding applications. Opportunities for observation of at least two different classroom settings while enrolled in a course in educational psychology might be arranged. Sound motion pictures and closed-circuit television offer many opportunities for helping the prospective teacher discover where the principles might apply.

A second example of application takes on a broader aspect:

> What does it mean *to live* anything that is to be learned? What does it mean for example, *to live persistence*? Can we not agree that actually to *live* persistence in any instance means (1) that one faces a life situation which itself calls for persistence; and (2) that one does then in his own heart accept the idea of persisting; and (3) accordingly does indeed so persist? When all these three things concur, then one has on that occasion *lived* persistence. If with this positive instance we contrast a negative one, the meaning may come clearer.

> Certain pupils were asked to write out the words of their morning flag salute. Among the various replies received the following were noted: I perjur legens; I plaig alegin; I pledge a legion; to the Republicans; one country invisable; one country inavisable; with liberty and jesters.
>
> Is it not at once clear that these pupils did not adequately *live* the meaning of the words used in the salute? Whatever else they may or may not have lived, it stands clear that they did not in any full or adequate degree *live* the meanings which the words were supposed to carry.
>
> It may be added that we can live things in many different degrees. Take feelings, for example; some we may live so slightly that we hardly think of them at the time, and soon forget all about them. Others we live so deeply and poignantly that we can hardly banish them to give due attention elsewhere needed [Kilpatrick, 1946, p. 535].

Now refer again to one of the principles for facilitating the learning of concepts: "Encourage and guide searching behavior." In terms of Kilpatrick's analysis, what does it mean to have fully understood and learned this principle? The person who has understood and fully learned this principle actually lives it in teaching–learning situations in which he finds himself: (1) he faces the situation by encouraging and guiding the pupils in the class to seek and search for better meanings and more accurate meanings than they presently have; (2) in his own heart he accepts the idea of searching for better meanings; and (3) his personal and teaching behavior patterns are characterized by searching behaviors.

6. Aid the Learner to Evaluate the Adequacy of His Concepts

This principle carries the identical meaning as it did previously when proposed for facilitating the learning of facts. It is also applicable to other learning outcomes which will be treated in subsequent chapters.

Self-evaluation of the adequacy of one's concepts is one of the most important attitudinal and cognitive learnings which individuals can acquire. Many individuals seem to develop an attitude of inquiry quite incidentally; others do not. As yet we have not found specific environmental influences whereby we can generalize precisely why it is that some individuals are continually seeking to evaluate not only their concepts but also their methods for acquiring them. It is quite certain, however, that when concepts are taught as facts to be memorized, opportunities to encourage self-evaluation are lost. Creating an attitude of seeking and searching as discussed previously, along with aiding learners to find means and sources for evaluating their concepts, is essential to the application of this principle.

SUMMARY

Facts, concepts, and related intellectual skills are important outcomes of learning, from kindergarten through graduate school. The results of many of man's experiences as organized into systems such as the alphabet and numbers are to be accepted and to be learned as facts by children in school. Deciding which of the large number of existing facts are to be acquired is a continuing problem for the teacher and learner, for facts are multiplying at a more rapid rate than any individual can match in acquisition. Acquisition of facts is improved through organizing factual material into appropriate learning units, securing the correct response on the first try, reinforcing correct responses and correcting errors immediately, practicing until the facts are firmly established, and evaluating the adequacy of the responses.

Concepts, generalizations, and principles have emerged also in human experience and have been incorporated into the symbols of language for the purpose of interpreting and communicating about the physical and social world. A concept has both a classification and a discrimination aspect and is both more and less than the instances or discrete experiences from which it is abstracted. The individual's concept of whatever a symbol stands for is the meanings he ascribes to it, and these meanings change with experience about the actualities for which the concept stands. The meanings which intelligent adults ascribe to such concepts as *time, space, government,* and *religion* change as more is experienced about each. Though a symbol and definition of it, also in symbols, may be memorized, this is not assurance that adequate meanings are acquired. The teacher can improve the learning of concepts through organizing concepts into appropriate learning units, encouraging and guiding searching behavior, organizing realistic experiences with the concept, giving concise, clear meanings of the concept, providing for applications of the concept, and aiding the learners to evaluate the adequacy of their concepts.

QUESTIONS AND ACTIVITIES

1. (a) Define fact, concept, and knowledge.
   (b) Give three examples of each, drawn from the subject matter and at the school level in which you are most interested.
   (c) Give three examples of each, drawn from Chapter 1.
   (d) Illustrate why it is difficult in some instances to differentiate between a fact and a concept.
2. (a) Discuss the extent to which and how sensing, discriminating, perceiving, and abstracting are essential to the acquisition of facts.
   (b) Repeat the exercise above for the formation of concepts.
3. List and discuss the factors which affect the patterning of perceptions.
4. (a) Write a short summary of the developmental trends in concept learning, based upon the research presented.
   (b) For subject matter you know best, give three generalizations in sentence form that you think most learners have acquired toward the end of each school level: primary, intermediate, junior high school, senior high school, college. Give the source or sources of information used in assigning the generalizations to school levels.

(c) How would you ascertain the extent to which the generalizations have been learned at the designated school levels?

5. (a) Describe a situation in which you might attempt to teach an individual or group some facts. State the facts you want learned.
   (b) In this situation, describe the implementation of the five principles for facilitating the learning of facts.
6. Many facts are presented in Table 6.1. Learn the facts sufficiently well so that you can reproduce the table without error. Use the five principles on page 173 in your learning and briefly describe the ways in which you used them. Present a record of the total amount of time required and also the amount of time for each learning session.
7. (a) Give two generalizations about the learning of concepts, based on Figure 6.5 and the related information.
   (b) Describe how you used the facts presented to arrive at the generalizations.
8. Discuss the research findings dealing with encouraging and guiding searching behavior, referring to the original articles as necessary.
9. (a) Activities 5 and 6 are intended to provide realistic experiences with the principles for learning facts. Which is the more realistic? Why?
   (b) State three concepts that you would encourage students to learn and around which you would organize realistic experiences. Describe the realistic experiences.
   (c) State three concepts for which you would not organize realistic experiences. Why not?
10. (a) What are the main problems encountered in providing clear, concise meanings?
    (b) In addition to sensory experiences and discriminations what is essential to concept formation? Provide examples.
11. Give three kinds of previous or current experiences that would help a student learn the principles in this chapter.

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Chapter 7 Cognitive Learning Outcomes II: Problem-Solving and Creativity

Are we solving our daily problems effectively and becoming the creative persons we might be? Individual and group problems arise more rapidly than new approaches needed to solve them effectively. And rather than working toward expressing our best ideas and feelings in vocal and written forms, in music, in drama, in art, or in physical movements, we tend to watch television, talk about trivialities, read "best sellers," or otherwise be engaged by noncreative activities. Many diversions are available to keep children and adults from thinking for themselves. The importance of thinking and other cognitive processes in acquiring facts and concepts was shown briefly in Chapter 6. They are given more attention now in connection with: (1) the nature of thinking, problem-solving, and creativity; (2) developmental trends in problem-solving and creative abilities; (3) principles for facilitating the acquisition of problem-solving techniques; (4) principles for encouraging creativity.

As in Chapter 6, the discussion is intended to provide information not only for working with pupils but also for one's own improvement.

THE NATURE OF THINKING, PROBLEM-SOLVING, AND CREATIVITY

One common feature of thinking, problem-solving, and creativity is that they occur in some situation or context. Thinking is about something, problem-solving requires a task, and creativity involves expressing something in some form. Another common feature is that these abilities exist among individuals on a continuum. We assume that everyone, except perhaps mentally deficient persons and very young children, can think, solve problems, and create but that at any age level there are wide differences among individuals. A third characteristic is that symbols are usually involved in all three, though writing a poem requires a higher degree of symbolization than does performing a dance. When considering, however, what a teacher or parent can do to help children think more clearly, solve problems more efficiently, or produce something new or novel, we encounter many questions (some unanswered), as will be seen in the subsequent discussions.

Thinking

The precise level at which rudimentary mental activity like that of young children, apes, or mentally deficient persons may be called thinking is not clear. Thinking with the use of symbols emerged gradually in the human species and is changing continuously as we add to our knowledge and skills. In the ontogenetic development of the human individual, there is a gradual emergence of thinking with the use of symbols from the rather random and not highly directed sensing and discriminating of early infancy. The infant, like the ape, can sense and make discriminations among objects and places in his environment, and this discrimination requires mental activity.

In this chapter, however, the main concern is with higher-level thinking in which words and other symbols commonly employed in everyday activities are manipulated. Examine three exercises, ranging from simple to complex, that require thinking: (a) What is the opposite of cold? (b) How are facts acquired? (c) Design a school for 1800 high school students. Thinking with symbols is required in attempting to deal with all three exercises.

Though attempts have been made to describe thought processes by means of subjective procedures, including introspection, controlled experimentation, statistical procedures, and combinations of these, we know little about the improvement of thinking (Johnson, 1955). We now turn to some ideas about thinking, proposed by persons who have studied the subject quite intensively, and then to a summary of their ideas.

Dewey identified five phases or aspects of reflective thinking: "(1) suggestions, in which the mind leaps forward to possible solution; (2) an intellectualization of the difficulty or perplexity that has been *felt* (directly experienced) into a problem to be solved, a question for which the answer must be sought; (3) the use of one suggestion after another as a leading idea, or hypothesis, to initiate and guide observation and other operations in the collection of factual materials; (4) the mental elaboration of the idea or supposition . . . ; and (5) testing the hypothesis by overt or imaginative action (Dewey, 1933, p. 107)." Dewey stressed particularly that thinking "involves (1) a state of doubt, hesitation, perplexity, mental difficulty in which the thinking originates, and (2) an act of searching, hunting, inquiring to find material that will resolve the doubt, settle and dispose of the perplexity." Dewey's concept of thinking serves as a basis for problem-solving and is widely accepted as such. For example, Kingsley and Garry identify the components of thought processes in problem-solving thus: "While the course of thinking out the solution of a problem varies somewhat for different cases, in general, examination reveals the following characteristic stages in the process: First, a difficulty is felt; second, the problem is clarified and defined; third, a search for clues is made; fourth, various suggestions appear and are evaluated or tried out; fifth, a suggested solution is accepted or the thinker gives up in defeat; and sixth, the solution is tested."[1]

Wertheimer summarized his ideas about productive thinking as follows:

> . . . in the desire to get at real understanding, requestioning and investigation start. A certain region in the field becomes crucial, is focused; but does not become isolated.
>
> A new, deeper structural view of the situation develops, involving changes in the functional meaning, the grouping, etc. of the items.
>
> Directed by what is required by the structure of a situation for a crucial region, one is led to a reasonable prediction, which—like the other parts of the structure—calls for verification, direct or indirect [Wertheimer, 1945, p. 167].

If you were now to accept as an important question "What is thinking," you would attempt to organize your present and past experiences into some sort of focus. This is your perceptual field as proposed by Wertheimer. In turn, if you are satisfied with your present meanings and organization, no productive thinking will occur. However, if you are dissatisfied you will attempt to seek closure, that is, to fill in the parts of the whole and in turn bring them into a fuller total organization which is satisfactory for you. In this process of acquiring a complete perceptual pattern with sufficient meaning to be satisfying, the emphasis is upon structuring and restructuring of one's perceptual field—a somewhat broader concept than Dewey's problem-solving approach.

Guilford (1959) introduced fruitful ideas in connection with his factor-analytic studies of human intellect. Whereas Dewey and Wertheimer treated thinking as a process per se, Guilford differentiates between both the outcomes and the processes of thinking. He proposed five intellectual processes, including divergent thinking:

> Cognition means discovery or rediscovery or recognition. Memory means retention of what is cognized. Two kinds of productive-thinking operations generate new information from known information and remembered information. In divergent-thinking operations we think in different directions sometimes searching, sometimes seeking variety. In convergent thinking the information leads to one right answer or to a recognized best or conventional answer. In evaluation we reach decision as to goodness, correctness, suitability or adequacy of what we know, what we remember, and what we produced in productive thinking [Guilford, 1959, p. 470].

In the above statement Guilford equates cognition and convergent thinking with reasoning. The outcomes of divergent thinking, however, are different from reasoning and can be most directly associated with creativity, as will be shown subsequently in this chapter. Guilford states: "The unique feature of divergent production is that a variety of responses is produced. The product is not completely determined by the given information. This is not to say that divergent thinking does not come into play in the total process of reaching a unique conclusion, for it comes into play wherever there is trial-and-error-thinking [p. 473]."

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[1] H. L. Kingsley and R. Garry, *The Nature and Conditions of Learning*, 2d ed. © 1957. Prentice-Hall, Inc., Englewood Cliffs, N.J., pp. 421–422. Reprinted by permission of the publisher.

Note that both convergent and divergent thinking are forms of productive thinking. As stated earlier, reasoning and convergent thinking are similar, if not identical, processes. And reasoning has been investigated widely. For example, McNemar (1955) arranged four tests to measure reasoning: false premises, essential operations, syllogisms, and problem-solving. A total of forty-six males and twenty-seven females whose scores were the highest 15 percent on the tests and an equal number of males and females whose scores were the lowest 15 percent were used as subjects; all were sophomores at Stanford University. Among other things, the good reasoners were found to be superior to the poor reasoners in accuracy of both deduction and induction processes and in speed of induction. The good reasoners were superior in eliminating sources of errors, in locating a crucial aspect of the problem, and in control of various elements of the situation in the problem.

McNemar included both males and females in her study. However, in other studies a sex difference in reasoning has been found (Kostick, 1954). Three hundred eleventh-grade boys selected from three widely separated school systems were superior to three hundred eleventh-grade girls in drawing proper conclusions deductively. The boys' superiority over the girls was not related to intelligence, previous knowledge about the material, reading comprehension, reading preferences, practice effects, or knowledge of pertinent principles.

What are the common elements ascribed to thinking? First, all authors cited agree that thinking involves mental activity which originates with a feeling of perplexity, doubt, or dissatisfaction as the individual perceives something in his environment that is not completely satisfying or meaningful. Second, for the thinking to be productive, rather than aimless reverie or daydreaming, there is a focusing upon a problem or perceived elements of the environment. This situation or problem must be intellectualized, formulated, or stated in such way that it is relatively clear to the thinker. In mathematics, in painting a picture, in composing a song, in writing a short story, the individual must have a reasonably clear idea of what the problem is in order for him to focus upon it and to think productively towards reaching some type of solution. Third, once the problem is intellectualized, thinking is directed toward the solution. In some problem situations the solution comes quickly; in others the individual may continue his efforts intermittently for months and years. Fourth, after a solution is tentatively accepted, testing it out or evaluating it follows. The present information and methods one has, his hypotheses about the solution, and the particular social or other context in which the individual is carrying on his efforts are all related to the testing or evaluating aspect of thinking.

Thought processes exist on a continuum and it is difficult to ascertain when an individual is thinking toward solution of a problem and when he is merely sensing and discriminating. Beyond this, there are also at least two directions of thinking. One is that directed toward acquiring a solution or closure to a problem for which there is a known or a generally accepted answer. "Logical thinking," "critical thinking," and "reasoning" are terms used quite generally to describe this direction. Another direction is that of seeking a new (at least to the thinker) or not generally accepted solution. This direction of thinking, called "divergent" by Guilford, has been termed by others "creative thinking," "imaginative thinking," and "original thinking."

Having now read about thinking, attempt to clarify what it means to help children to think clearly or productively. What does it mean for first-graders? fifth-grade children? high school students? college students? What directions of thinking are demanded? That which leads to already known answers or solutions which we teachers can quite readily identify as right or wrong? Do we also want the direction of thinking which might lead to solutions of which we teachers are not aware? Consider, for example, the following question: "Are our school buildings and classrooms suitable for the efficient development of human abilities?" With the question so posed, we might limit our thinking and investigations to the school buildings and classrooms now in use and bring forth an affirmative or negative judgment. Now consider a different question: "What sort of spaces, equipment, and materials are needed to develop human abilities most efficiently?" The latter question might lead some persons to formulate ideas which up to the present time have been considered by few, if any, people.

Problem-Solving

In the previous section it was shown that thinking is necessary for solving problems and also that most, if not all, higher-level convergent and divergent thinking originates as the individual identifies and attempts to solve problems. We now consider in more detail the nature of problems, problem-solving processes, problem-solving in groups, and factors which may retard efficient problem-solving.

THE NATURE OF PROBLEMS. A problem exists for the individual when he encounters a situation where he must respond but where he does not have immediately available the methods, the information, or both to arrive at a solution without further thinking. Consider two illustrations of what a problem is and is not. When a child first encounters a situation where he must use long division to arrive at a solution, he does not have the needed method. To acquire this method, problem-solving activities such as those outlined by Dewey are required. Once the child has solved several problems using long division, further exercises of the same type and level of difficulty are no longer classified as problems, inasmuch as the learner already has in his behavior repertoire both the needed method and the necessary information. Making a copy of a printed page is not considered a problem for the experienced typist since both the method and the needed information already are available and no further thinking about the information or the method is required. If, however, the typist were presented material in shorthand and did not know how to read some of the symbols, a problem would be faced.

Problems are now examined further from the standpoint of ego involvement, complexity, and inherent meaning. Suppose that a young woman in her senior year is preparing to teach. She has received an excellent offer for a first position and has also recently received a marriage proposal from a desirable and desired man. In this particular situation she cannot do both. A problem is presented; a decision must be made. In this instance there is high ego involvement. In many situations such as buying clothing, buying a first automobile, deciding upon a career, and learning to get along well with particular human beings there is high ego involvement in the problem.

Problems may be arranged on a continuum from low to high complexity. Some problems can be encountered in a given moment and a few moments later a solution is achieved. Other problems cannot be solved except with systematic effort over a long period of time. Some problems require only minor changes and improvements in already acquired methods; others require the abandonment of the present method in favor of a completely different one. Similarly, some problems require little new information; others require vast amounts of information. A principal task of the teacher who attempts to help learners identify significant problems is to decide the kinds of methods and information they are capable of acquiring at their levels of development.

Many of the problems which lead to high-level reasoning and divergent thinking cannot be identified by some people. At all school levels it is assumed that the teacher, because of his greater knowledge of the field and his broader experience, can identify significant problems somewhat better than can the students. He then presents the problems to learners orally or in written form. By using simple vocabulary which the learner can understand, and by using symbols which the learner can relate to his own experience, the teacher can add a higher degree of meaning to the problems he presents. Consider the two examples:

1. A raft floated down a river for nine miles. It took five minutes to float the first three miles. How much time was required for the nine-mile journey?
2. Bill lives nine blocks from school. He walks three blocks in five minutes. How long does it take him to walk nine blocks?

From the standpoint of vocabulary difficulty and from the learners' experiences with the situations, the latter example carries more inherent meanings and can serve as well as the first to build mathematical understandings and skills. Many boys and girls, however, might not accept either example as a real problem.

A PROBLEM-SOLVING SEQUENCE. Table 7.1 shows the relationship between purposeful learning and problem-solving processes. In the left-hand column are the characteristics of purposeful learning as they were given in

TABLE 7.1 The Relationship Between Purposeful Learning and Problem-Solving Processes

Sequence in Purposeful Learning	Cognitive Processes	Problem-Solving Processes
The learner becomes motivated and sets a goal	Perceiving	The individual experiences doubt, difficulty, or lack of meaning connected with some elements of his situation. This feeling is intellectualized or verbalized into a problem, the solution of which is the goal.
	Remembering	
Appraises the situation, means-goal relationships	Discriminating	Means-solution relationships, including methods and information, are thought about; tentative hypotheses or solutions are thought about.
	Abstracting	
Makes preliminary trials		First attempts at possible hypotheses or solutions are made.
	Integrating	
Continues trials; applies previously acquired cognitive and/or psychomotor abilities to the task	Generalizing	Old, refined, and new methods are tried; previously acquired and new information is analyzed and more definite solutions or hypotheses developed.
	Evaluating	
Confirms appropriate responses, drops inappropriate	Thinking	Hypotheses are tested and, if confirmed, are accepted as solution to problem.
Reaches goal		Solution of the problem.
Experiences satisfaction		Experiencing of satisfaction.

Figure 1.1; in the right-hand column is a sequence of problem-solving processes; and in the middle column are the cognitive processes, all of which are involved at one point or another both in purposeful learning and in problem-solving.

Notice that in purposeful learning the learner becomes motivated and sets a goal. In the problem-solving sequence the individual, in some form of transaction or perceptual relationship with his environment, experiences doubt, difficulty, or lack of meaning—a vague to well-defined feeling of need to do something. He intellectualizes or verbalizes the relationship between the need and the situation into a problem. Once the problem is thus intellectualized, achieving a solution becomes the individual's goal. Already, while feeling a need and verbalizing the problem, he appraises the situation, including the means-goal relationships. These relationships involve both the methods and information needed to arrive at first preliminary hypotheses or proposed solutions. In some problems, first attempts at possible hypotheses or solutions are made very quickly after clarification of the problem. In some complex problem situations the hypothesizing may come after the individual's thinking activity about the problem is interrupted by other activities for a week, a month, or longer, depending upon how important the immediate solution to the problem is.

The usual approach to newly experienced problems is to try to solve them using methods and information already possessed. When this effort does not lead to fruitful hypotheses or solutions, new methods, new information, or both are essential. The new methods and information are analyzed and evaluated. The next step in the sequence shows that the hypotheses resulting from thinking are tested, and if one is confirmed, it is accepted as the solution to the problem. This testing may be accomplished in relatively short time or it may require months or years. One important characteristic of problem-solving behavior is to delay judgment and not to accept an inappropriate solution. Once a solution, appropriate or inappropriate, is accepted, the individual is no longer in a state of feeling of need or tension to reach a solution; his goal is reached and is accompanied by a feeling of satisfaction.

Some additional remarks are needed to relate the problem-solving sequence to other outcomes of learning. Content is always involved in a problem and is not always purely semantic or symbolic. Many important problems cannot be solved simply by thought; very often the individual must actively seek information. If the solution of the problem involves production of anything—a poem, a short story, a musical composition, a design for a bridge or house—some psychomotor abilities are also required. Since many of the most critical problems facing mankind today are interpersonal, how the problem-solver feels toward others and how they feel toward him affect his efficiency. Beyond this also, solutions to social problems must be in terms of the effects on the people affected by the solution.

INSIGHT AND TRIAL AND CONFIRMATION IN PROBLEM-SOLVING. Bayles (1952), like Gestalt psychologists generally, strongly emphasizes the importance of insight in acquiring solutions to problems. Insight carries the idea of interpreting a problem situation, including appraisal of means-solution relationships and suddenly arriving at the solution. Some problems are apparently solved quite suddenly as the individual sees for the first time the relationships among the various parts and the solution. Here is a representative example: "With six matches of equal length, make four and only four equilateral triangles." Graduate students, given this problem verbally and told to manipulate the six matches, frequently are baffled and cannot reach a solution independently. They attempt to make the six equilateral triangles with the matches in a horizontal plane. However, after working with the matches they sometimes accidentally put one or two up from the horizontal plane into a pyramid form. Once the pyramid form is perceived, and this perception appears suddenly, the individual does achieve the solution and thereafter can quickly reproduce the solution. This sudden perception and understanding of means-ends or method-solution relationships is characteristic of some problems. However, solution of many other problems involves trial and confirmation or, in the usual terminology of problem-solving, the formulation and testing of successive hypotheses. Consider now an example of the latter type.

Imagine a committee of juniors and seniors in high school who must decide appropriate apparel for the Junior Prom. They know that about half of the students will not attend if formal dress is required. The committee members would like everyone to attend. In a problem situation such as this, the solution does not suddenly emerge as with the matches and equilateral triangles. Rather, a variety of proposals or hypotheses is made. Each of these is discussed and tested as various persons give their reactions to the proposals or hypotheses. Though someone in the group may quite suddenly perceive a solution, it is likely that sudden solutions will not have originated without considerable trial and confirmation, not only by one individual, but by most individuals in the committee. Thus, solutions should not be considered as being arrived at only by sudden insight or only through a long process of hypothesizing and testing out hypotheses. An individual or group may achieve a solution quite suddenly when clearly perceiving means-end relationships for the first time; if the complexity and nature of the problem are different, a number of possible solutions or hypotheses may be proposed, each tried out, and one finally accepted.

RIGIDITY AND PROBLEM-SOLVING. No one knows precisely why some highly intelligent individuals at any age level identify significant problems and achieve equally significant solutions, whereas other equally intelligent persons do not identify significant problems or, if so, they do not develop the methods or acquire the information needed to solve them. Some individuals rigidly persist with an already established method or specific interpretation of information to solve one type of problem, whereas in other problems they may be quite flexible. We can, for example, be good problem-solvers in the science laboratory but refuse to apply problem-solving techniques to political or other social problems in the community. In the laboratory we demand controlled experimental data; in the community we seek types of evidence to back up our already established biases.

Johnson (1955) reviewed the available literature regarding flexibility and rigidity in problem-solving and concluded that the existence of a general factor of rigidity or flexibility, independent of other personality traits, has not yet been found. Though this is the case, Johnson noted that some individuals rigidly adhere to a previous method of approach or solution and do not depart from it, though they might reach a solution through other methods and approaches which are used by other individuals in the same or similar situations. Further, within individuals generally there is considerable variability in approaching various problems with flexibility or rigidity, depending upon the inherent nature and content of the problems. These ideas about set and rigidity in problem-solving are illustrated further in the subsequent discussions of more specific research findings.

Goldner (1957) found that rigidity and flexibility are fairly consistent characteristics of individuals in meeting a series of tasks that are similar in nature. However, when individuals are presented varying types of problem-solving tasks, they are rigid on one type but quite flexible on another.

Birch and Rabinowitz (1951) found that past experience keeps individuals from using objects in different ways when they are presented with a problem where the objects must be used in a different manner from that previously experienced. In this experiment one group of students first solved a problem—completing an electrical circuit—using a switch; the second group solved the problem using a relay; and the control group had no previous experience or instruction with either a switch or relay. After this initial experience a more difficult problem was presented to the first two groups and to the control group. The results showed that the group with previous training with the switch used the switch almost exclusively in solving the new problem, the one trained with the relay used only the relay in the new problem, and the control group used the relay and the switch about equally.

Other researchers have also reported that specific prior experience with the use of an object or method in one problem-solving situation limits the individual's perception of the possible properties and uses of the object or method in a different or new problem. Luchins (1942) and Schroder and Rotter (1953) found that when individuals were taught to solve a series of related problems by one method they persisted in using that method in solving other problems, even when the method repeatedly did not work. In both studies the conclusion was that persons taught by a single method and having experienced success repeatedly in solving a series of related problems tend to cling to that method even when repeated trials with it are found not to work in solving new problems.

SUCCESS AND FAILURE IN PROBLEM-SOLVING. The effects of success and failure in problem-solving are similar to the effects with other outcomes of learning. Repeated failures result in giving up, substituting a different goal, or other forms of unproductive behavior. Rhine (1955) found that problem-solving processes after failure experiences were significantly inferior to those following success experiences. Schroder and Hunt (1957) did a most interesting study to find the effect of success and failure at various points in the problem-solving process. College and high school students who withdrew from the problem-solving situation prior to achieving a solution set higher goals originally, used fewer alternative solutions in attempting to solve the problem, and performed less effectively after failure than did those who achieved the solutions.

There are implications for the teacher in these studies of the effects of rigidity and failure on problem-solving. He must make certain that more than one method or approach is encouraged and must provide help to the individuals who are trying hard but who are experiencing failure at some point in the problem-solving process.

PROBLEM-SOLVING BY GROUPS. Teachers generally work with groups as well as with individuals and often present to the whole class or smaller groups within it the opportunity to identify and solve problems. Sometimes the group must make decisions. The decisions are needed to delimit the scope of the problem, the general method of approach, who will do what part of it, and so on.

The size of the group, the feelings of the group members toward one another, the nature of the problem, and the importance of the problem to each member of the group are all important factors related to efficient problem-solving by groups. Inasmuch as the answers to the question of how to produce better problem-solving in individuals is not completely clear, we are in a most tentative position with respect to describing efficient problem-solving in group situations. Lorge *et al.* (1958) reviewed the research conducted about problem-solving in groups for the period 1920-1957. They tried to identify the investigations which contrasted or compared the quality of problem-solving performance by individuals and by groups. Their main conclusions about the effectiveness of individuals and groups, and some suggestions about the inadequacy of present knowledge, are included in the following summary of their work:

> In general, in the evaluation of the relative quality of the products produced by groups in contrast to those produced by individuals, the group is superior. The superiority of the group, however, all too frequently, is not as great as would be expected from an interactional theory. In many studies, the product of the "best" individual is superior to that of the "best" group. It is quite probable that group solution may have its advantages in stimulating one another for, and in inducing cooperation for, a common solution. Yet, it must be recognized that group procedures may have disadvantages, too. A single member, or a coalition of members, may retard the group by holding out for its kind of solution—a consequent that may reduce the quality of the group product if the solutions so proposed are inadequate or unrealistic.
>
> Obviously, it would be valuable to study group processes to ascertain how members facilitate or inhibit the development of a group product. But, it is just as important to ascertain the quality of product developed by groups in contrast to those of individuals. The researches reviewed in this survey are limited to the experimental assessment of the quality of group and of individual products. Currently, the research literature is in a terminological confusion, generally, in that the group involved in the experimental studies is an *ad hoc* group created by the experimenter for the experimenter's purposes, but that the experimenter generalizes to a traditioned group which has organized for a common purpose and has been interacting over a considerable period of time. A similar conflict of terms is involved in the definition of the individual. Experimentally, the individual is a person selected at random from some population, but the interpretation suggests that even the best individuals cannot appraise or solve a problem in the round. Since some individuals can, the essential question is to determine how the efficient and able individual compares with the traditioned and able group.
>
> In the researches reviewed, moreover, the range of tasks varies from estimating (e.g., the number of beans in a bottle) to solving genuine problems (e.g., the productivity of an assembly line). The significance of these tasks in involving individuals and groups does differ and so do the problem-solving processes. Nevertheless, the experimenters tend to interpret the results of all tasks in terms of the relative ability of groups and of individuals to solve novel problems of policy or procedure.
>
> The researchers, to date, tend to treat the *ad hoc* group solving a trivial task as a prototype of the fully traditioned group solving a very important problem. The microscopic approach is a prerequisite to understanding the genuine group but is not itself the understanding [Lorge, *et al.*, 1958, pp. 369–70].

Most of the research being done on problem-solving by groups, including decision-making, is in college or military settings. In some experiments a number of individuals, often unacquainted with one another, are paid to engage in the problem-solving experiment. Unpaid subjects usually participate to meet course or military requirements. The problems posed to these groups, as proposed by Lorge above, are often of the type which do not secure high ego involvement. Nevertheless, our research information comes from such experimental arrangements rather than from functionally operating groups—the family, the school classroom group, the church group, local public officials, and the like.

Decisions by a group such as a policy-making committee composed of the superintendent of schools and the school principals or a curriculum committee in the public schools markedly affect the life and learning activities of both teachers and pupils. What do we know about useful principles for guiding such decision-making groups? Edwards (1954) reported on the vast amount of theorizing and research about decision-making that has been done, mostly since 1950. He pointed out many problems which yet need to be clarified and solved before principles of decision-making by groups can be stated clearly. Thus, a great deal of trial-and-confirmation behavior must be utilized by the teacher in class and in other school situations in order to give students opportunities to make decisions in groups and to determine how such factors as size of the group, liking among the members, kind of problem to be attacked, and ego involvement with the task affect decision-making.

Creativity

While visiting classrooms in our elementary schools, high schools, and colleges, one looks at the students and wonders which of these will eventually be the outstanding musical composer, the great artist, the engineer, the scientist, the novelist, the statesman. What is happening in these classrooms that will encourage all of the students to develop their creative abilities, abilities which exist to some degree in all human beings? And what can be done, starting in kindergarten, to nurture the creative abilities of all children? As you have experienced education thus far, how much of your instruction has been directed toward acquiring the knowledge and methods that mankind already possesses? How often were you encouraged to produce, to express yourself, to question present knowledge or methods, to try something different?

Visit the many high school classrooms now organized for academically talented students. Observe the content and method of instruction. You may experience the uncomfortable feeling that perhaps the creative individual of tomorrow will not come from these classroom groups. There is a possibility that a large number of the creative individuals are somehow lost by the criteria used in selecting the academically talented and that creativity in those identified is being submerged through instruction which focuses almost solely on the acquisition of larger and larger masses of already known facts and tested methods.

FACTORS IN CREATIVITY. Intelligence tests and achievement tests are more useful in identifying high-achieving pupils than was the case twenty or thirty years ago. But it is also clear that there is much variability in creativity among students who score high in both subject-matter achievement and intelligence whether the creative area is symbolic, musical, artistic, or physical. This and other matters related to creativity are now examined.

Drevdahl (1956) studied creativity in a group of college students. Creativity was assessed by two raters. Each rater checked the student on a seven-point scale of creativity. The first rating was based upon the raters' own definition of creativity and the second rating was based upon a definition devised from the ideas of all the raters. No significant difference was found between the ratings based on the raters' own concept of creativity and those based on the following definition:

> Creativity is the capacity of persons to produce compositions, products, or ideas of any sort which are essentially new or novel, and previously unknown to the producer. It can be imaginative activity, or thought synthesis, where the product is not a mere summation. It may involve the forming of new patterns and combinations of information derived from past experience, and the transplanting of old relationships to new situations and may involve the generation of new correlates. It must be purposeful or goal directed, not mere idle fantasy—although, it need not have immediate practical application or be a perfect and complete product. It may take the form of an artistic, literary or scientific production or may be of a procedural or methodological nature [Drevdahl, 1956, p. 22].

On the basis of the two ratings the students were divided into creative and noncreative groups and into art and science groups for further testing. The creative group was found to be superior to the noncreative group in verbal facility, fluency, flexibility, and originality. The main differences between the art and science creative groups were that the creative artists were more radical and self-sufficient than creative scientists and noncreative persons in either the sciences or the arts; and the art group was also more sensitive emotionally and more unconventional. In this study the creative artists showed the same average intelligence as the creative scientist. IQ in itself was found useless in identifying the creative and noncreative individual although all the students were in college and presumably of above average intelligence.

Taking a somewhat different approach, Drevdahl and Cattell (1958) selected living artists and writers who had already established good reputations in their fields. The total group included thirty-one general writers, sixty-four artists, and fifty-eight science-fiction writers. The creative artists and writers differed from the normal adult population in being more intelligent, emotionally mature, dominant, adventurous, emotionally sensitive, unconventional, radical, self-sufficient, and of high ergic tension level. Artists in this group were found to be somewhat more unconventional and less intelligent than writers. The science-fiction writers appeared to be somewhat more radical than non-science-fiction writers or artists. The science-fiction writers also tended to be less emotionally sensitive than the artist or non-science-fiction writers. In both Drevdahl studies, verbal facility and fluency, flexibility, originality, emotional sensitivity, unconventionality, and radicalism appeared as traits which to some extent differentiated creative from noncreative groups. As we turn to the work of other persons in this field, note that some of the same terms appear.

Wilson, Guilford, and Christensen (1953) described originality as existing on a continuum, assumed that everyone is original to some degree, and also assumed that the amount of ability to produce original ideas could be inferred from performance on tests. Rather than defining an original product as one that did not exist before, they investigated three alternative dimensions of originality: uncommonness, remoteness, and cleverness. By uncommonness of response was meant something infrequently produced by the population of which the individual is a member. Remoteness of association was defined as the ability to make remote or indirect associations that are not made frequently by the population of which the individual is a member. Tests were constructed to measure these two abilities associated with creativity. Cleverness was defined as the ability to produce responses that are rated clever by judges. In this study the uncommonness and the cleverness of the response or product were more closely associated with originality than was remoteness.

Subsequently, Guilford (1957) incorporated earlier studies of creativity into his general scheme of intellectual abilities and hypothesized that both convergent and divergent thinking as well as cognition, memory, and evaluation are required in creativity in all fields, but that the more specific abilities related to convergent and divergent thinking might be different for artists and scientists, for example, but parallel. His best judgment was that creative artists will show some factors different from scientists and managers but that there will still be a large number of similar factors. Of the many hypothesized, three are definitely established as related to creativity: fluency, flexibility, and originality. These factors, of course, are based on products produced by the individuals; therefore productivity as a factor in creativity is now considered.

PRODUCTIVITY. Persons may have daydreams and do a great deal of thinking of the divergent sort. However, unless those thoughts somehow become incorporated into a product, the creative ideas themselves may never be evident. This is true at all school levels, kindergarten through graduate school, and applies also to all adults, including teachers.

An excellent source of information about productivity is Terman (1954). After identifying children with IQ's of 140 and higher in the early 1920's, Terman made several follow-up studies. When the males in the group were twenty-five years or older, the 150 rated highest in success as measured by productivity (not income) and the 150 rated lowest were compared on a number of items that had been gathered from their childhood. During the elementary school years the high and low success groups had been much alike, having about the same grades and tested achievements.

Early in high school the groups began to draw apart, with the success group getting higher grades. A far greater percent of the successful adult group had finished college. The most spectacular differences, however, showed up between the two groups in 1940, when they were twenty-five years old or older. The productive group, far more than the less productive group, was superior in these personality characteristics: persistence in the accomplishment of ends, integration toward goals as contrasted to drifting, self-confidence, and freedom from inferiority feelings. The successful group appeared to have a much stronger drive to achieve good all-around mental and social adjustments and was relatively free from severe emotional tensions that bordered on the abnormal. Terman concluded that productive achievements and IQ are far from perfectly correlated, just as Guilford, Drevdahl, and others have more recently concluded.

In summary, creativity exists on a continuum. Creativity involves not one but many abilities; three of these are fluency, flexibility, and originality. Beyond these abilities there must also be productivity, and this motive to produce something originates in problem-solving situations as outlined in the previous section. Besides the personality characteristics associated with productivity as identified immediately above by Terman, other factors found by one or more investigators are emotional maturity, emotional sensitivity, adventurousness, high energy with a tendency toward dominance, radicalness, and self-sufficiency. The latter do not imply, however, an abnormal degree of emotional instability or queerness. The individual must be sufficiently well adjusted to himself and the society in which he lives so that his feelings toward self and others do not become disturbing enough to block his productivity. However, society, including school people, must be willing to accept, rather than punish, some forms of expression and behavior that differ from generally accepted norms so that the specially creative child or youth is not ostracized or humiliated for being different.

DEVELOPMENTAL TRENDS IN PROBLEM-SOLVING AND CREATIVE ABILITIES

In Chapter 3 an indication was given of the development of abilities in the cognitive and psychomotor domains. As children grow older they make better discriminations, associate more and new meanings with their experiences, remember previous experiences better, and can better integrate, abstract, and generalize. Imagining and evaluating also become more complex. As the child learns in school, his knowledge increases and he acquires independent means of securing information. Since all of these learnings and skills are required in problem-solving, we conclude that with increasing age there is also increased ability to solve problems.

Unfortunately, very little systematic research has been done to identify the types of problems which children solve at various ages or the difficulty level of problems appropriate for learners of the same chronological age but of varying mental abilities. Quick sources of information from which to make some estimates about the difficulty of problems are standardized achievement tests and standardized intelligence tests. Another source of information is textbooks. Much is yet to be learned about the type and difficulty of problems which children might accomplish with optimum instruction.

Psychomotor abilities were also shown to emerge and improve throughout the maturational period. With each succeeding year after birth, there is increase in strength, speed, precision, coordination, and flexibility. In the solution of problems where these abilities are required, it is probable that there is general improvement with maturation. But here, too, we have much to learn about difficulty levels of problems that require the use of psychomotor abilities.

After about age six, children learn to meet emotional situations somewhat less explosively and to control their emotions somewhat better; this permits them to study and work more effectively in school situations. Simultaneously, however, some attitudes and values, including prejudices, become more fixed and generalized. It is entirely possible that primary school children are already establishing sets and attitudes which prevent their accepting information or perceiving the important elements in a problem-solving situation. Unfortunately, we can presently make only relatively gross estimates of the affective characteristics of children and youth which may enhance their ability to solve problems efficiently and to develop their creative abilities. The principles discussed in the next sections must be considered tentative rather than definitive.

PRINCIPLES FOR IMPROVING PROBLEM-SOLVING ABILITIES

Six principles are now set forth for nuturing problem-solving abilities:

1. Activate solvable problems in the learning situation.
2. Assist the learner to state and delimit the problems.
3. Assist the learner in finding needed information and methods.
4. Aid the learner in interpreting and analyzing information and methods.
5. Provide opportunities for stating and testing hypotheses.
6. Encourage independent discovery and evaluation.

To clarify each of these six principles, examples will be given from the experiences of a group of students enrolled in a course in educational psychology. The class consisted of twenty-five seniors with majors in home economics or business education, preparing to teach in high school. During the first five weeks of the semester, these prospective teachers took the educational psychology class, methods classes, and one class in the major field. These classes met five days a week for fifty minutes daily. After five weeks the students went from the university campus into public high schools and did their student teaching for seven weeks. They were in the school throughout the school day, five days a week. After seven weeks of student teaching, the students returned to the campus for the last four weeks of the semester, their classes meeting daily as before their student teaching.

1. Activate Solvable Problems in the Learning Situation

On the first day of the class, the instructor passed out a mimeographed outline divided into three parts: an introductory statement, a list of problems which student teachers and teachers in service frequently experience, and a short reference list. The list of problems was written after a study of what research showed to be the main problems experienced by student teachers and teachers in service. In turn, the instructor decided which of the many problems were most appropriate for this particular course. The short introductory statement presented to the class follows:

> Every attempt will be made by the instructor to conduct this course in line with what he thinks to be desirable conditions for promoting maximum efficiency of learning. In this connection, he assumes that
>
> a. every student in this class wants to learn about human abilities and the nature of learning in order to become a successful student teacher;
> b. the student will identify significant problems in order to learn efficiently;
> c. the student will actively engage in finding solutions to his problems;
> d. the resources among the students, the instructor, and the university are sufficient to enable each student to learn efficiently;
> e. the student can learn through reading, discussing, thinking, and doing;
> f. every student who is willing to accept the related responsibility should be given a wide degree of freedom in assuming direction of his own learning problems;
> g. every student who is willing to accept the related responsibility should be treated as a mature individual and a beginning member of the teaching profession.

These ideas were discussed briefly on the first day of the class, and attention was directed toward the list of problems which was presented in the second part of the outline. After some discussion of the problems provided in the outline, the students proposed a few others.

As presented and first discussed the problems were simply words for some of the students. Whole-class and small-group discussions clarified what they meant or might mean when the student was actually engaged in student teaching. The instructor and most of the students during the first week concluded that here were significant problems that could be partially, if not completely, solved during the semester.

2. Assist the Learner to State and Delimit the Problems

The students and instructor spent most of the first week in discussing possible delimitations of the problems in terms of the situation. From the total list of eighteen problems, each student chose one as of most immediate concern and on which he would most like to work before going into student teaching. The class was then organized into six groups, according to the first-problem choice of each student. These six problems as finally stated by students were:

1. What are the attributes of a successful teacher?
2. How can I attain an orderly work situation in the classroom, free from disruptive incidents?
3. How can I provide for differences among pupils in rate of learning?
4. How can I encourage all pupils to want to learn?
5. What is the general course of purposeful learning?
6. What can or should I do to help pupils acquire well-integrated personalities and character?

During the first four weeks when the students were not actually working on the problems, the instructor presented his analysis of two other problems: (1) What principles would help me in teaching students psychomotor abilities in typewriting, sewing, swimming, and the like? (2) What principles would help me in teaching students knowledge and related cognitive abilities, such as comprehending, analyzing, evaluating, creating?

In attempting to solve the problem before going out for student teaching, the class agreed that three things would be done. First, each group would secure information about its problem, mainly through reading. An annotated bibliography was to be developed by each group and eventually distributed to the entire class with recommendations as to what everyone should probably read at some time during the semester. Second, after each individual had acquired some information through reading and discussions in class, a list of principles was to be developed by each group as the tentative solution to the problem. These principles also were to be distributed to the remainder of the class before the students left for student teaching. Third, the students and the instructor agreed that during regular class periods in the fourth and fifth weeks of the semester each group would demonstrate and subsequently discuss one or more of its principles. This, of course, took six class periods. The instructor encouraged the students to use this opportunity to get first-hand experience in teaching, and made it clear that he and the rest of the class would also try to make it a successful experience for the demonstrating group.

In this situation, then, there was delimitation of the problem in several steps. The first was to find out what the statement or problem really meant in practice and to state it in such way that there was reasonable opportunity for securing or making progress toward a solution during the semester. The second step was to decide the form in which the solution to the problem might appear. Three forms were agreed upon: first, a statement of generalizations; second, a demonstration of one or more of the generalizations in class; and third, a testing and evaluating of these generalizations during the student teaching.

During the first three weeks, at least half of the class periods were used in stating and delimiting the problem, in discussing information-gathering procedures, in analyzing information, and in organizing the generalizations. Also, individuals met with the instructor outside of class and each of the groups met with him at least twice to consider various aspects of the problem-solving situation. It can be seen that delimitation of the problem did not occur suddenly but started in the first week and continued well into the third week. A considerable amount of the delimiting, of course, started after the students began securing information about the problems.

3. *Assist the Learner in Finding Needed Information and Methods*

Once individuals selected a problem and subsequently organized themselves into groups, they needed information. Methods for getting information were devised by the groups, and procedures for bringing together and analyzing information were worked out. The instructor gave only a minimum reference list composed of one basic textbook, a supplementary textbook, and five books of readings. However, this list included a number of selections pertaining to each of the problems. To this extent the instructor provided help, but he did not refer the students to any specific selection or group of selections that might be related to a particular problem. Students were helped in identifying various guides for use of the library, including the location of the current periodicals room and various reserve rooms. Only when individuals or groups asked for further specific help as to sources of information did the instructor give such help. From the start the students were encouraged to draw upon and contribute information in the smaller group from their previous experiences and knowledge about the problem.

In most groups it was a relatively simple matter to apportion responsibilities for examining the list of references provided in the course outline. Subsequently, each group developed procedures for going beyond the reference list. With occasional help they developed the means for recording their findings and for developing a fairly uniform system for writing the annotated bibliography. These bibliographies contained from eighteen to thirty-five different entries. In checking these entries, the instructor found that about 60 percent of the entries were the same as those he had used in a previous topical outline of the course before attempting this problem-solving approach to instruction. The other 40 percent were new entries, most of which were excellent and of which the instructor had not been aware. For the most part, the new entries were drawn from the professional journals in home economics and business education and from methods books in those fields.

4. Aid the Learner in Interpreting and Analyzing

When the individuals brought in information and started to write the generalizations in the small groups, considerable help was needed. Several class periods and meetings outside class with the instructor were needed to develop the first draft. As many as three out-of-class meetings were needed with some groups before a fairly well-organized statement of generalizations appeared.

One of the larger problems faced in interpreting and analyzing information was that, when the groups of three to six students started comparing what they had gathered, parts of it did not agree or, at least, needed to be analyzed in terms of the larger problem. The critical point came when the diverse information was to be incorporated in a fairly economical list of principles. The first list of principles tended to be exceedingly long, with thirty-five to forty entries. Once a typewritten copy of these was available to all members of the group, careful analysis started. Overlappings and discrepancies were found. At this point the instructor volunteered help and was called upon frequently. Had there been more time available, most of the groups would probably have analyzed and organized the information reasonably well themselves.

Now follows the list of principles which a group of four students developed:

PROBLEM: HOW CAN I ATTAIN AN ORDERLY WORK SITUATION IN THE CLASSROOM, FREE FROM DISRUPTIVE INCIDENTS?

1. Take it for granted that the class is well intentioned and expect good behavior from them.
2. Do whatever is necessary and appropriate to get a reasonable amount of order, especially in the first meeting with the class.
3. Let the pupils know what is expected of them and make sure the expectations are reasonable and appropriate, for example, with respect to (a) standards of conduct, (b) class assignments and activities, (c) homework and other out-of-class activities.
4. Teach and illustrate, giving due consideration to the students' interests and backgrounds such as learning ability, age, home background.
5. Maintain an active class with a variety of projects—not a monotonous routine.
6. Be consistent and impartial.
7. Be courteous to students—avoid the use of sarcasm and ridicule.
8. Promise only what can be carried out.
9. Arrange the situation so that crises are avoided.
10. Investigate the causes of misconduct carefully and take appropriate action, since the purpose of discipline is correction, not punishment.

This economical list of principles was based on information from thirty-five different sources and represents only a small portion of the many facts and concepts acquired by the students in their searching for a solution.

A second group of students, preparing for teaching business education, mainly typewriting and shorthand, had as their problem to provide for differences among pupils in rate of learning in skill subjects. Though the instructor had originally stated the problem in broad terms of providing for differences among pupils generally, these students delimited the problem to their specific interest. Their introductory statement and principles are now shown:

HOW CAN I PROVIDE FOR DIFFERENCES AMONG PUPILS IN RATE OF LEARNING IN SKILL SUBJECTS?

Up to the present time, extensive pretesting has not been used to determine different rates of learning ability in skill subjects. Therefore, we will make two assumptions:

1. Skill classes are heterogeneous.
2. The teacher will have to deal with individual differences within the classes.

The aim of the teacher in handling individual differences is not to mold every student to the same pattern, but to assay the assets and liabilities of each student and to work with the individuals and groups so that members of the class, both individually and collectively, show a net profit at the end of the school year.

A. *Dealing with individual differences within the classroom:*

1. Ask questions which in general vary from easy to more difficult, so that all will have an opportunity to respond successfully.
2. Motivate the learners through praise and encouragement each day.
3. Enliven your class by having each student keep his own daily personal progress chart.
4. Give directions slowly, clearly, and simply.
5. Organize groups within the class into ability levels and work with these individually with the help of audio-aids.
6. Let the fast learner occasionally help the slow learner. An example of this in a shorthand class would be to let the accelerated student dictate to the slower students and demonstrate shorthand outlines at the board.
7. Use audio-visual aids, such as tape recorders, movies, and records, for supplementary demonstrations.
8. Encourage the pupil to set his own goals, try for them, and decide for himself how good the results are.
9. Manage practice so that the learners as individuals or in small groups can proceed at appropriate rates.

B. *Dealing with individual differences outside of the classroom:*

1. Assign homework with different levels of difficulty that will be in line with the different interests and purposes of the major groups in the class.
2. Have a classroom library with materials of several levels of difficulty relating to the skill subjects.
3. Provide opportunities and facilities for students to improve their skills through purposeful practice in their spare time.
4. Have out-of-class sessions to determine the root of trouble for any student encountering difficulty.

Recognize that these statements of principles were drawn up within a four-week period, that the students also gathered information on other problems, that the instructor used about one-fourth of all class periods to present information on other problems, and that six days were used for demonstrating one or more of the principles by each group. The two groups of principles as developed by the students represent their best generalized conclusions about reasonable solutions to the problem prior to student teaching.

5. Provide Opportunities for Stating and Testing Hypotheses

As soon as the student first identified a problem and started thinking about it individually and discussing it in his group, hypotheses were already being formulated. Thus, there were approximately three stages in hypothesis formulation and testing: first, securing the information and drawing up the list of principles; second, demonstrating one or more of the principles; third, actual student teaching. A considerable number of hypotheses were accepted and others were rejected—including, perhaps, some good ones. However, each list of principles was in fact a list of hypotheses which the students first tried out in discussions and subsequently in the demonstration before the class. The demonstration provided the first main test of one or more of the principles. Until students began planning for the demonstration, the principles did not carry the meaning which a principle should. However, when the students began deciding which one or more of the principles could be demonstrated in the classroom, the testing of the principle or hypothesis took form.

In the case of providing for differences in skill subjects, a very skillful demonstration was arranged in a business education laboratory. One student acted as a teacher and dictated shorthand at a moderate speed to a second student while two other students took dictation from tape recorders, one at a low speed and the other at a high speed. The demonstration clearly showed that with sufficient equipment, shorthand dictation could be given at speeds suitable to the rate of at least three different groups of learners within a classroom.

6. Encourage Independent Discovery and Evaluation

This situation in educational psychology was excellent for encouraging independent discovery and evaluation. Only those students ready for student teaching during the semester were permitted to enroll, and during the five weeks preceding and the four weeks after student teaching, a relatively small number of other classes was taken. This arrangement permitted each student to plan his study and work schedule more efficiently than did the usual arrangement of taking five or six classes; in turn, the student had more time outside class meetings to gather information independently, to meet with other members of his group, and the like. Further, the students perceived themselves as full-time student teachers. Their motivation for identifying and solving problems was high.

The instructor generally withheld direct evaluation of the students' statements of principles and their demonstrations. He did not tell the students that anything was definitely right or wrong, that anything was complete or incomplete. Instead he raised questions. The raising of questions, along with discussions, served to help the students arrive at conclusions independently. Further, the instructor had as one main instructional goal the encouragement of independent discovery and evaluation by students so that when they are subsequently on their own in teaching positions they will not fall into a monotonous teaching method or way of life. The goal, if achieved, will lead toward their seeking to find better ways of improving problem-solving abilities of their pupils. They will not be satisfied with someone else telling them what, when, and how to teach.

On the basis of the instructor's day-to-day evaluation of this classroom situation, the independent discovery and evaluation by the students yielded excellent results. Under a previous instructional arrangement wherein students took the class without doing student teaching, they had memorized principles and tried to associate as much meaning as possible with them. However, in the present situation the student did not have to memorize the principles he and his group developed, for they were already incorporated quite well into his total pattern of meaningful learning. Further, the principles drawn up by the other groups were demonstrated, discussed, and appeared to be as useful for guiding practices during student teaching as did those proposed by the instructor for the two problems he discussed. A small minority of students indicated that they would have preferred the instructor's handling all of the problems by presenting information and demonstrations and leading whole-class and small-group discussions. Twenty-two of the twenty-five students indicated that this was the first time they had been expected to accept the responsibility for their own learning efficiency. In addition some of them for the first time used the various library tools which had been available and were waiting for their use throughout the first three and one-half years of their university life. They felt that their skill in identifying and using sources of information was an important one which could be applied in their subsequent teaching careers.

PRINCIPLES FOR ENCOURAGING CREATIVITY

From research on creativity as outlined in the first part of this chapter, a few principles are inferred. These principles for encouraging creativity are not so firmly fixed in research findings as are those in Chapter 6 related to the learning of facts and concepts or as those for problem-solving in the preceding section. We do not know enough about the nature of creativity to identify reliably children now in school who may be the highly creative individuals of tomorrow. However, we do know that creativity is found to some extent in all individuals, except perhaps the mentally deficient.

MacLeish (1959) had this to say about the differences between the usual college course and the one set up to encourage creative writing:

> The truth is that the whole situation in a writing course is a reversal of the usual academic pattern. Not only is there no subject, there is no content either. Or, more precisely, the content is the work produced by students in the course. And the relation of the teacher to his students is thus the opposite of the relation one would expect to find. Ordinarily it is the teacher who knows, the student who learns. Here it is the student who knows, or should, and the teacher who learns or tries to. The student writes. The teacher reads. And the object of the teacher's reading is to learn if he can how closely the knowing of the words approximate the knowing of their writer. It may be less. It may be far, far more, for such is the nature of the struggle between a writer and the obdurate material of words in which he works. But whether less or more, the only question the man who undertakes to teach can ask, is the question of the adequacy of the writing to its own intent. As a writer himself he may call it "good" or "bad." As a man he may have this human opinion of the mind which conceived it. But as a teacher of writing it is not his task to tell his students what they should try to write or to judge their work by the standards he would apply to his own or his "betters"! [MacLeish, 1959, p. 160].

Precisely what the ideas proposed by MacLeish, an eminent teacher of creative writing, mean for the first-, the sixth-, or the tenth-grade teacher is not immediately known. MacLeish restricts enrollment in his writing course to twelve students. These students want to learn to write. The usual public school or college teacher is faced with a somewhat different situation. However, in most, if not all, classes there are probably some learners who would like to produce something other than a repetition or replication of factual information or forms which other persons have already developed. Consider now some further ideas about encouraging creativity as shown in the following principles:

1. Encourage original expressions in many media.
2. Foster flexibility rather than dependent conformity.
3. Allow time for creativity to unfold.
4. Encourage productivity.

1. Encourage Original Expressions in Many Media

If original expressions were limited only to those involving the use of symbols in written form, many individuals would not be highly original or learn to express their feelings and ideas with spontaneity. Besides using symbols to write poetry, short stories, novels, biography, and so on, children can also express themselves orally in words and song, rhythmically in physical activities, in the fine arts, the applied arts—in most if not all curriculum areas incorporated in our schools, kindergarten through graduate work. And originality is concerned not only with content but also with method. As shown in the discussion of the learning of facts, if, as in the spelling and pronunciation of words, only one form and content is acceptable, it is unwise to permit originality. We simply could not communicate if we did not agree upon factual bases for certain kinds of expression. However, we teachers often believe without valid foundation that there is only one proper content or one correct method.

This belief in correct method has done much to block original expressions and improved performances. In athletics it is known that many records stood for years simply because coaches generally agreed that there was only one proper or correct form for such things as putting the shot, shooting a basketball, running the mile, running the 100-yard dash, and the like. Over long periods of time, fairly static top limits were expected. Then, a coach permitted a young man to follow his own method in putting the shot, and very soon the record went up markedly. A coach permitted basketball players to start shooting one-handed, and soon a much higher percent of accuracy emerged. The forward pass greatly changed the character of football. To give examples from another area of learning, over many years a given content and methodology of oil painting is followed. Finally some nonconforming individuals break away from this method, and soon we have different forms and content in art expression. American composers required many years to depart from the style and general content of the Western European composers of music. Once the break was made, and aided by new means of communication such as radio and television, new forms of composition uniquely American emerged. This seems to be the history of original expression. Certain methods are followed for a number of years, even centuries, and then when enough dissatisfactions appear, the old methods and forms are discarded.

If original expression in many media—written language, oral language, rhythms, music, art—is to emerge, there must be opportunity in the school day for instruction directed toward this end. The typical school curriculum, filled primarily with assignments and other activities through which the students are to learn and reproduce what mankind already knows, does not in itself encourage original expression.

The dearth of originality in meeting the critical problems of our times is shown in an editorial by Lear (1959) in which he quotes an unpublished manuscript of Dr. Fred L. Polak, brilliant cultural sociologist of the University of Rotterdam in Holland, as follows:

> Many observers believe that especially that typical totality of human life and endeavor which we commonly call Western culture is showing rather alarming symptoms of apathy and aversion, even of negativism and defeatism, precisely toward belief in a different and better time to come. A regressive tendency has

> appeared, withdrawing from idealistic renewal and constant concern about future survival to the restricted day-by-day anxiety about existential self-preservation in the incidental events of the present time. . . .
>
> A dangerous, gaping spiritual vacuum thus threatens to originate, all the more dangerous because in other parts of the world a simultaneous phenomenal motive force is expanding, electrifying images of the future with values and standards partly antithetic to our Western spirit, thrusting up new "types" of culture with great attractive power. The ideological contrasts that are aroused have called forth a new kind of spiritual struggle for existence. . . . I am convinced the struggle will be won by the force that is ultimately strongest in predominant images of the future.[1]

Other leading thinkers, including psychologists, feel that somehow American children and youth, as well as the present generation of adults, are not learning to meet challenges of the time with original, novel approaches. We may be relying far too heavily on attempting to educate by means of information giving and too infrequently encourage children and youth to explore new and different ways of expressing their own ideas and feelings.

2. Foster Flexibility Rather Than Dependent Conformity

Flexibility does not mean lawlessness or lack of values. Rather, it implies a readiness to make changes in behavior to meet circumstances that have not previously been met satisfactorily, or to cope with completely new circumstances. Scientific knowledge and knowledge of the physical world generally are increasing so rapidly that we as individuals and as groups are today constantly meeting situations for which we have no known means of responding productively.

When school systems first set up classes for children of high achievements and high IQ, the teachers of these classes inevitably complain that the students, whether fifth- or eleventh-graders, have not developed the right study habits and work procedures. The eleventh-grade history teacher insists that all students must learn his method of note-taking. The seventh-grade teacher insists that there is only one proper, neat way to work the assigned mathematics exercises. In social studies the fifth-grade teacher proposes that there is only one correct method of outlining factual information from textbooks. The pupils, however, were originally selected for the special classes because of their exceptionally high achievements. The teachers, rather than insisting upon a single method as the best and only one for all the pupils, would do better first to find out the methods these high-achieving pupils have been using with a good deal of success. If the eleventh-grade history teacher spent a day or two talking with the students and observing them to discover their methods of learning, the teacher himself might learn a better method for studying history which might involve little note-taking. At least he would probably recognize more than one good method of note-taking; if not, the bright students could then consider carefully with him how they could learn more efficiently through following his method than the ones they had already devised. This in no way denies that the teacher with excellent experience should not pass on the results of such experience to the student. It does mean, however, that many high-achieving, bright students have probably acquired as efficient or more efficient means of learning than have many teachers and that the students' methods should be given careful consideration rather than being ridiculed or rejected outright.

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[1] Fred L. Polak (University of Rotterdam), as quoted by John Lear in "The Book That Made Man Timeless: Origin of Species," Science and Humanity section, *Saturday Review*, November 14, 1959, p. 62.

Getzels and Jackson (1959) provided the author an unpublished summary of their considerable research dealing with highly intelligent and highly creative adolescents. They found a wide range in creativity among high school students of above-average intelligence. Some students of high intelligence are highly creative; others are not. Some students of just above-average intelligence are more creative than are others of high intelligence. Getzels and Jackson also found that high school teachers preferred students of high IQ and lower creativity to those of lower intelligence and high creativity. The high IQ students who are not highly creative but achieve high are more preferred than are the highly creative students who achieve equally high. Though basing their definitions of creativity on test results, Getzels and Jackson see a tragedy in American education at all levels in that we fail to distinguish between our convergent and divergent talent: that is, between students who reason well and come forth with acceptable conclusions already known and those who come up with new or different methods and ideas.

3. *Allow Time for Creativity to Unfold*

Figure 7.1 from Johnson (1955) shows the intellectual activities of poets and artists during four quarters of a creative enterprise. Notice that the poets and artists spend a great deal of time in early preparation. Then there is a considerable increase in the time given to formulation of the idea, whatever it is. As the preparation falls off from the third to the fourth quarter, revision increases markedly. There are, of course, wide differences in the total length of time required to bring forth the poem or the painting. Some poets and artists spend years on a large product. Smaller products are produced in a short time. Some novelists, too, start and complete a work in less than a year. Others spend as much as five or more years from the time they have the ideas about a novel until it is finished.

The above discussion suggests that the teacher cannot simply state to a group of pupils that in a given length of time they are to produce something. He cannot simply appear before a class and say, "Now write a poem," or, "Get out your art materials and, before the period ends in thirty minutes, give me something to display on the bulletin board." From the idea to the finished product, time and effort are essential. Kindergarten children will, of course, do a finger painting in three to five minutes, wash their hands,

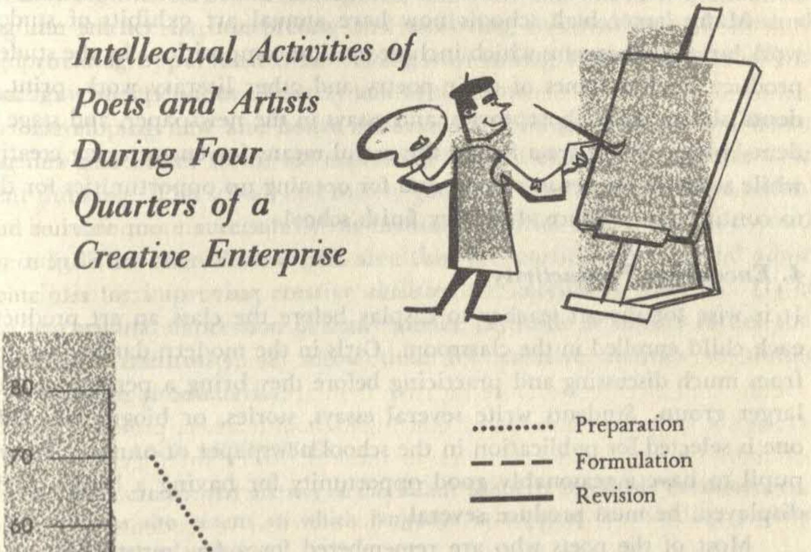

FIGURE 7.1. *(Adapted from Johnson, 1955, p. 30.)*

and go to some other activity. If given a blank sheet of paper and crayon, primary school children in a relatively short time fill the page with something and are ready for another activity.

Such spontaneous expressions are to be highly encouraged. The teacher well knows that enthusiasm for and reinforcement of the child's early expressions, and presentation of subsequent opportunities for continuing the expressions and the building of essential skills, will lead to creative projects satisfying to the individual. Some of these early projects may have lasting and permanent value not only to the individual but to a considerable segment of the school population, or even the larger population.

Many larger high schools now have annual art exhibits of students' work, arrange programs which include musical compositions by the students, produce small volumes of their poetry and other literary work, print students' short poems, short stories, and essays in the newspaper, and stage students' plays. These are a few of the useful means for encouraging creativity while students are yet in school, and for opening up opportunities for them to continue to produce after they finish school.

4. Encourage Productivity

It is wise for the art teacher to display before the class an art product of each child enrolled in the classroom. Girls in the modern dance class profit from much discussing and practicing before they bring a performance to a larger group. Students write several essays, stories, or biographies before one is selected for publication in the school newspaper or annual. For each pupil to have a reasonably good opportunity for having a better product displayed, he must produce several.

Most of the poets who are remembered for a few outstanding poems produced a large number, many of which were not published or at least were not well received. In school situations, also, we should encourage learners to transform some of their ideas rather consistently into a product, be it in written symbols, oral expression, art, music, or bodily expression such as in dance or dramatics. But productivity must be emphasized. Examination of the lives of men and women who have given something of permanent value to society leads to the inevitable conclusion that one must be productive.

SUMMARY

Thinking, problem-solving, and creating always occur in a situation or context, not as abstract processes. Thinking is about something, problem-solving is directed toward solution of a problem, and creativity involves expressing something in some form. Cognitive processes directed toward finding an already accepted or logical conclusion are usually designated by such terms as reasoning, convergent thinking, or critical thinking. Divergent, creative, and imaginative thinking are directed toward finding new or novel conclusions, methods, or forms of expression. Some convergent thinking is involved in divergent thinking, and vice versa.

Problem-solving requires purposeful activity. The solution to some problems occurs suddenly with insight; in other problems, there is a continuing process of posing possible solutions, rejecting, and finally confirming one as most appropriate or correct. Problem-solving abilities of children and youth are improved through (1) activating solvable problems in the learning situation, (2) assisting the learner to state and delimit the problem, (3) assisting the learner in finding needed information and methods, (4) aiding the learner in interpreting and analyzing information and methods, (5) providing opportunities for stating and testing hypotheses, and (6) encouraging independent discovery and evaluation.

Developing new and better methods for solving problems and inventing new and better forms for expressing human experiences require divergent thinking. The school and society generally must identify more reliably and nurture more successfully the creative abilities of children and youth. Since little has been done in this area thus far, particularly in social affairs, principles for improving creative abilities are necessarily tentative: (1) encourage original expression in many media, (2) foster flexibility rather than dependent conformity, (3) allow time for creative abilities to unfold, (4) encourage productivity.

QUESTIONS AND ACTIVITIES

1. (a) When can mental activity of the infant properly be called "thinking"?
   (b) Discuss the extent to which language is required in thinking, problem-solving, and creating.
2. (a) In what respects is divergent thinking different from and similar to other thinking? Refer to the references cited for each of these.
   (b) In what respect are the outcomes of divergent thinking the same as or different from other forms?
   (c) Describe briefly the sequence of thought processes and activities in which you engaged to answer (a) or (b).
3. Discuss the nature of a problem in terms of
   (a) ego involvement; (b) complexity; (c) inherent meaning; (d) sequence in solving.
4. (a) Discuss the results of research dealing with rigidity and problem-solving.
   (b) Describe the effects of success and failure in problem-solving.
   (c) Compare the conclusions of Lorge about problem-solving by individuals and groups with those in the article by Duncan, suggested for further reading.
5. (a) Compare Drevdahl's, Guilford's, and Terman's conclusions included in the discussion of creativity. Read at least one of the articles.
   (b) Evaluate your personal characteristics, abilities, and present situation from the standpoint of creativity.
6. Describe a classroom or other situation in order to illustrate the teacher's implementation of principles for improving problem-solving abilities. Follow the style of the illustration in the chapter, if you wish.
7. State a complex problem that you have solved without help and indicate which of the principles apply.
8. Give your opinions of the course in educational psychology described in this chapter.

9. Evaluate the generalizations developed by the students to attain an orderly work situation. To provide for differences in skill subjects.
10. (a) For each principle dealing with creativity, write a short statement, describing conditions within the learner, the teacher, and the situation favorable to its implementation.
    (b) Do the same for conditions that might hinder its implementation.

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Chapter 8 Psychomotor Abilities and Skills

The success of mankind in gaining control over his environment has been heavily dependent upon channeling his motor abilities into rather highly specialized skills. At some point along the way in man's history, the invention and development of tools and instruments required a specialized use of psychomotor abilities. Tools and instruments employed today in such activities as handwriting, playing a musical instrument, producing an art object, and designing a bridge or a house require not only psychomotor abilities but also perception of stimuli through seeing, hearing, or feeling. In turn, these perceptual experiences guide the motor activities of the individual in producing or doing something.

Physical activities such as swimming, dancing, and singing in themselves give satisfaction to the individual. In some occupations, speed and strength give an advantage to the individual. Throughout school the child or youth who has acquired a relatively large repertoire of skilled activities has some advantage over the one who has not. The nature and importance of psychomotor abilities and skills are treated further with the discussions centered on four topical areas as follows: (1) the nature of psychomotor abilities; (2) developmental trends in psychomotor abilities; (3) characteristics of skilled performance; (4) principles for improving skill learning.

THE NATURE OF PSYCHOMOTOR ABILITIES

Some significant breakthroughs in identifying psychomotor abilities have occurred since the beginning of World War II. Two approaches are being pursued with enthusiasm and vigor in recent years. The first is to identify more positively the motor abilities which lay the basis for efficient motor acts as such. The second is to devise psychomotor tests, intended to identify the individuals who would likely be successful in acquiring complex skills such as those required of pilots and navigators of aircraft. Along with these emphases, there is continuing study of the abilities essential for students to develop proficiency in such fields as typewriting, playing musical instruments, and performing a variety of occupational tasks—clerical work and various skilled and semiskilled jobs.

Guilford (1958) set forth a theoretical framework of psychomotor abilities as shown in Table 8.1. Notice that in Table 8.1 strength, impulsion, speed, static precision, dynamic precision, coordination, and flexibility are designated psychomotor factors. The psychomotor abilities are use or manipulation of some part of the body with relation to the psychomotor factors.

TABLE 8.1. ***Matrix of the Psychomotor Factors, with Columns for Kinds of Abilities and Rows for Parts of the Body Involved***

Part of Body Involved	Type of Ability						
	Strength	Impulsion	Speed	Static Precision	Dynamic Precision	Coordination	Flexibility
Gross	General strength	General reaction time		Static balance	Dynamic balance	Gross bodily coordination	
Trunk	Trunk strength						Trunk flexibility
Limbs	Limb strength	Limb thrust	Arm speed	Arm steadiness	Arm aiming		Leg flexibility
Hand		Tapping			Hand aiming	Hand dexterity	
Finger			Finger speed			Finger dexterity	

SOURCE: *Guilford, 1958, p. 165.*

For example, there is a general (gross) strength ability or abilities, trunk strength ability, and limb strength ability. Similarly, in the third column the abilities of general reaction time, limb thrust, and (hand) tapping are related to the psychomotor factor, impulsion. There are many blank spaces in Table 8.1. The theoretical framework is not, therefore, complete; and Guilford expressed the hope that further research would indicate what the missing abilities might be, so that the blank spaces would eventually be filled in. The technical difference between factors and abilities is shown in Table 8.1, but in common usage the factors—strength, speed, etc.—are also treated as abilities. The tests used to secure performance measures from which the factors and abilities were derived are mainly of three types: tests of physical fitness, apparatus tests, and printed tests of one kind or another. The factors, of course, are inferred from performances on the tests, and it is through a statistical procedure that the so-called factors are derived.

A large amount of work needs to be done to relate the abilities shown in Table 8.1 to the many psychomotor skills which are learned and used in school and in the daily life activities of children and youth. For example, which abilities are required in playing a musical instrument? To what extent are limb strength, general reaction time, arm and finger speed, arm steadiness, dynamic balance, gross bodily coordination, hand dexterity, and finger dexterity involved in learning to play the violin or piano? These same questions, of course, can be asked about such curriculum areas as typewriting, art, industrial arts, and many games and sports.

Fleishman (1953) tried to ascertain the psychomotor abilities needed by personnel in the Air Force, particularly in connection with flying. Guilford's list of factors is somewhat similar to his, in part because Guilford drew upon the work of Fleishman (and other researchers) in setting up the schematic arrangement shown in Table 8.1. The factors positively identified by Fleishman were reaction time, tapping, manual dexterity, finger dexterity, steadiness, aiming, and motor kinesthesis or gross precision. He also found three others which were not so clearly established: psychomotor coordination, ambidexterity, and psychomotor precision. Other factors also shown to be highly significant in predicting the success of Air Force personnel were spatial relations, perceptual speed, mechanical experience, and pilot interest. Thus, other factors, not directly motor as proposed by Guilford, are required in complex psychomotor skills. The same is true in the many school activities in which the individual must perceive some form of stimulus to initiate and guide his subsequent motor responses. It is equally important, however, to note that the motor abilities which require little or no perception set some limits upon the efficiency with which an individual can respond to the notes in music or can respond to the words in typing.

Interesting from the standpoint of learning more about psychomotor abilities, but somewhat discouraging from the standpoint of identifying precisely what these abilities may be, is another study of Fleishman (1957). Two hundred airmen in basic training received extended practice on seven different psychomotor tasks: rotary pursuit, plane control, kinesthetic coordination, unidimensional matching, two-hand matching, discrimination reaction time, and complex coordination. The airmen received considerably more practice on the complex coordination task than on the other six. In addition to these seven tasks the airmen were also given eight reference tests: instrument comprehension, reaction time, rate of movement, pattern comprehension, mechanical principles, general mechanics, speed of identification, and visual pursuit. The results of this study confirm previous findings by Fleishman and his associates that there were considerable but systematic changes in the pattern of abilities contributing to proficiency on the complex coordination task from the beginning of the practice to the end. Some abilities were found to increase in importance with practice, others were shown to decrease, and still others remained at a fairly stable level throughout the entire length of practice. In other words, certain abilities found to be important in early performance of the task were not so important during final practice and vice versa. Fleishman hypothesized that perhaps kinesthetic abilities played an increasingly important role at higher levels of proficiency in a complex task and that individual differences at advanced levels of proficiency are somewhat a function of skill in integrating well-learned component abilities, whereas in the earlier practice these component abilities are contributing to individual differences.

Fleishman's conclusion about changes in the relative importance or weight of various abilities is almost identical to that which Woodrow (1938) found in connection with seven so-called verbal skills, including adding numbers, substituting digits for letters, reproducing patterns, and solving anagrams. Woodrow found no one general improvement factor to underlie all of these skills. Further, the amount of original ability on the seven tests, as measured before extended practice, had no bearing upon the change with practice; i.e., the possession of high ability at the start did not assure a greater than average or smaller than average gain with practice. Marked changes occurred in the relative importance or weight of each of several factors from the beginning to the end of practice.

In applying the conclusions of Fleishman and Woodrow to psychomotor learning in school situations, one would properly infer that one could not reliably predict every student's performance after a semester or year of instruction from students' performances during the first month of instruction. The predictions would be better than guessing, however. Also, if one measured the performances of beginning piano players and identified the factor or factors at that point which comprise the beginners' abilities, one would have to make follow-up studies to ascertain the extent to which these abilities change with practice and improved performances. Unfortunately, we do not now have the needed information to relate all psychomotor abilities, as proposed by Guilford and Fleishman, to most instructional areas in school. Large sums of money have been spent since the beginning of World War II on the making of these excellent studies of psychomotor abilities in military personnel. Such research in the armed services saved many lives and vast sums of money, along with greatly improving many phases of military training. However, no such monies have been made available for conducting research with children and youth in school settings. Research funds from the Federal government and research by various Federal agencies are now receiving more attention.

One of the most comprehensive studies of performances in a variety of physical activities was undertaken by the American Association for Health, Physical Education, and Recreation and reported by Hunsicker (1958). In this investigation, 8500 boys and girls in Grades 5 through 12 took a series of physical performance tests: the pull-up, the sit-up, the shuttle run, the standing broad jump, the 50-yard dash, the softball throw for distance, the 600-yard run-walk, and various aquatic tests. The results are incorporated in tables that show both the developmental aspects and individual differences among various groups within the grades. Although no further study was made of the separate psychomotor abilities underlying these various performances, it is possible that a considerable number of the abilities proposed in Table 8.1 are involved.

In summary, marked progress has been made in recent years to identify psychomotor abilities. Much yet remains to be done in school settings to ascertain the abilities of children and youth which may subsequently be open to observation by the teacher or indirectly to the teacher through testing programs. We must learn more about psychomotor abilities of both males and females at various age levels before we can make reasonable estimates of the improvement in these abilities or maximum limits of performance. We know that we can ascertain large differences in the motor performances among children of the same age but we often cannot reliably ascertain what is causing or associated with the varying levels of performance. We need to start with the best information available and move forward in this area just as was proposed in the previous chapter with respect to problem-solving abilities and creativity. In the meantime, we should do our best to provide optimum conditions for children and youth to develop whatever psychomotor abilities they may have.

DEVELOPMENTAL TRENDS IN PSYCHOMOTOR ABILITIES

Within the same week or month try to observe the psychomotor abilities of four widely separated age groups. Go to a nursery room in a large hospital and notice the newborn infants and their behaviors. Observe children of ages six to nine in the gymnasium or playground of an elementary school. Visit a comprehensive high school to observe an advanced typewriting class, an instrumental or vocal music class, an art or industrial arts class, an athletic team in practice, and a science class while experiments are being set up by the students. Finally, observe at work a surgeon, dancer, musician, or athlete. Though you would see only a small sample of each age group, the vast changes in psychomotor performances with age from infancy to maturity would be more immediately apparent than they can ever be made through reading about them. Only a few of the many descriptions of the change in various abilities with age are presented in the next sections. The words and statistics will become more meaningful if the reader broadens his knowledge through observation and through the study of other experiments.

Strength of Grip

In Chapter 3 strength of grip was shown to be more highly correlated with intelligence, reading, arithmetic, and language achievement than were any of four other physical measures—height, weight, number of permanent teeth, and bone development of the hand and wrist. Strength of grip is to some extent a measure of vitality. Also, strength of grip correlates higher with other measures of strength of the body than does any other single measure of bodily strength and is easily secured. For these reasons it holds more promise of providing useful information for the teacher than do the other four physical measures just noted.

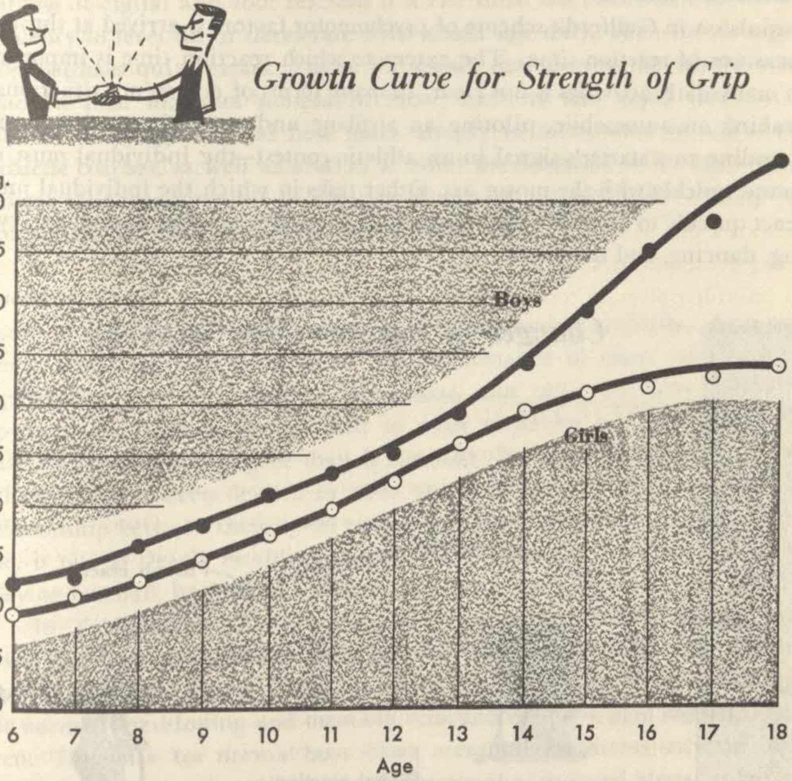


FIGURE 8.1. *(Adapted from Jones, 1944, p. 103.)*

Figure 8.1 shows growth curves, developed by Jones (1944) in a longitudinal study, for boys and girls ages six to eighteen. A standard hand dynamometer was used to secure strength of grip of the preferred hand for both boys and girls at the various ages. The dynamometer readings are in kilograms, as noted in the left margin of Figure 8.1. A rather steady increase in strength with age occurs, and the rate is about the same for boys and girls until age thirteen. At this time the curve rises quite sharply for boys and continues to rise slowly at a decelerating rate for girls. How much of the difference between the sexes at about age thirteen and thereafter is due to cultural factors is not known. Boys, however, are encouraged to participate in more strenuous physical activities than are girls. Further, strength is usually considered a prestige gainer for boys, whereas many girls during adolescence want to give the impression of being dainty and feminine rather than strong and masculine.

Reaction Time

Impulsion in Guilford's scheme of psychomotor factors is arrived at through measures of reaction time. The extent to which reaction time is important in many daily activities is not clear. In many forms of emergency situations—braking an automobile, piloting an airplane under certain conditions, responding to a starter's signal in an athletic contest—the individual must respond quickly with the motor act. Other tasks in which the individual must react quickly to successive stimuli include playing a musical instrument, typing, dancing, and the like.

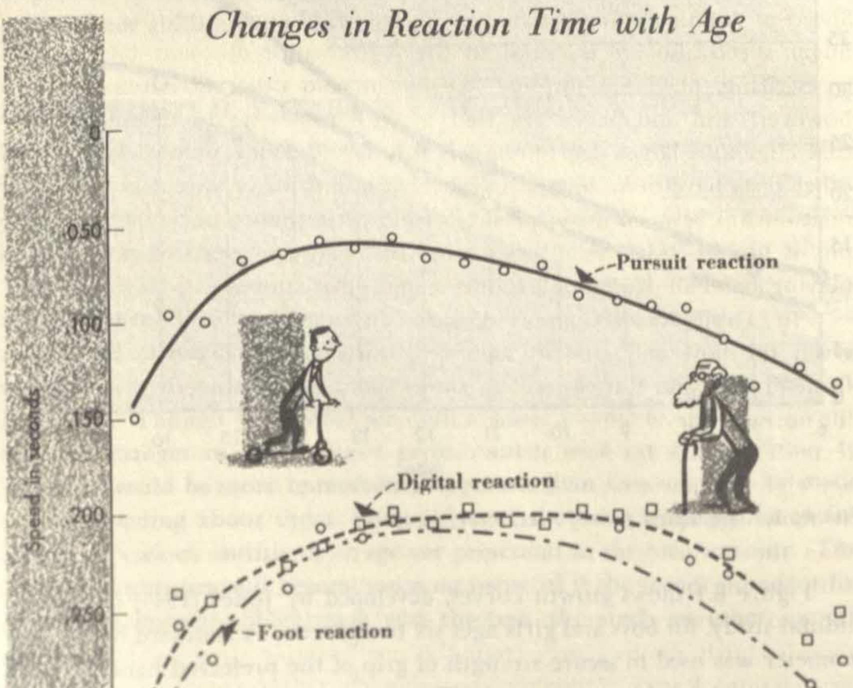


FIGURE 8.2. (*Adapted from Miles, 1931, p. 631.*)

Figure 8.2, from Miles (1931), shows different measures of reaction time according to age. All reaction measures of the subjects were elicited by an auditory stimulus. The measures are pursuit reaction using the hands, digital reaction using the forefinger, and foot reaction. The speed of pursuit movements increases regularly until about age eighteen and holds a fairly steady level until about age thirty; then decline starts, becoming quite rapid at about age seventy. Though the curves are somewhat different, the general pattern of digital and foot reaction is a rise until the twenties, and then a tendency to level off or decelerate until about age sixty, when the deceleration becomes quite rapid. Figure 8.2 shows that during the school years reaction time increases noticeably. How much of this rapid increase is related to instruction and how much simply to maturation is unknown. Athletic coaches, as well as coaches of other psychomotor skills, apparently believe that reaction time of individuals can be improved, for they spend much practice time toward achieving that end.

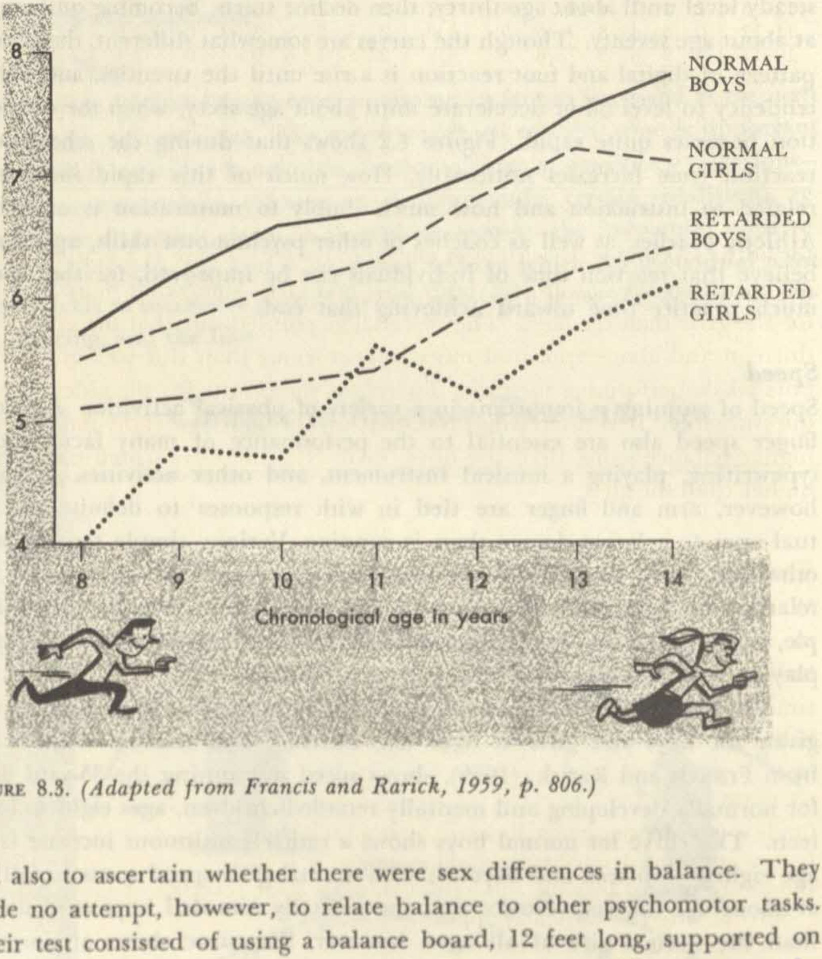
Speed

Speed of running is important in a variety of physical activities. Arm and finger speed also are essential to the performance of many factory jobs, typewriting, playing a musical instrument, and other activities. Usually, however, arm and finger are tied in with responses to definite perceptual cues to a larger degree than is running. Various simple tapping and other tests have been devised to assess arm and finger speed; however, the relationship between these speed tests and performance in typing, for example, is not so clearly established as is that between speed of running and playing baseball, basketball, football, and other sports.

In Table 3.5 of Chapter 3, speed in running the 50-yard dash was given for boys and girls at ages ten, thirteen, and sixteen. Figure 8.3, from Francis and Rarick (1959), shows speed in running the 35-yard dash for normally developing and mentally retarded children, ages eight to fourteen. The curve for normal boys shows a rather continuous increase from age eight to fourteen and beyond; with normal girls speed starts to fall off at about age thirteen. Notice that the mentally retarded boys were slower than the normal girls at all ages; however, the curve shows an increase with age for the mentally retarded boys, and at age fourteen they are closing the gap between themselves and the normal girls. The irregular curve for retarded girls results partly from the small sample used in the study by Francis and Rarick. Whether the relatively better performances for the retarded girls at ages thirteen to fourteen might continue is not known.

Balance

We know that the young child has difficulty in maintaining his balance as he is learning to walk. Cron and Pronko (1957) carried out an interesting investigation to find out the extent to which balance improves with age



Speed of Running Data for Normal and Mentally Retarded Children by Chronological Age

FIGURE 8.3. *(Adapted from Francis and Rarick, 1959, p. 806.)*

and also to ascertain whether there were sex differences in balance. They made no attempt, however, to relate balance to other psychomotor tasks. Their test consisted of using a balance board, 12 feet long, supported on either end 2 inches above the ground. Having no middle support, the board sagged and swayed somewhat, requiring compensatory movements by the subject. Each of 501 children (322 boys, 179 girls) was told before starting out that, if he stepped off the board before walking the length of it, he would get a score of zero; if he walked the length without stepping off, he would score one; and if he made a round trip, his score would be two. Each child was given three trials and could thus make a total score of six. The results, showing the distribution of scores by sex and age groups, are given in Table 8.2.

Table 8.2 shows a consistent rise in the mean or average balance scores

TABLE 8.2. Distribution of Balance-Board Scores by Sex and Age Groups

Age Groups	Boy's Scores							Average	Girls' Scores							Average	*N*	Totals Average
	0	1	2	3	4	5	6		0	1	2	3	4	5	6			
13–15	3	2	2	8	11	2	7	3.7	1	7	4	5	2	0	0	2.0	54	3.1
12–13	2	1	7	4	12	6	4	3.6	2	6	2	7	3	0	1	2.3	57	3.1
11–12	0	3	4	8	7	6	6	3.8	2	3	3	5	3	2	0	2.5	52	3.3
10–11	3	9	6	5	7	8	3	3.0	2	5	4	6	0	4	0	2.4	62	2.8
9–10	2	8	7	7	5	4	3	2.8	5	4	7	7	4	1	0	2.1	64	2.5
8– 9	7	11	8	9	11	2	2	2.5	7	6	6	5	4	2	0	2.0	80	2.3
7– 8	12	10	9	7	0	4	0	1.6	5	3	3	3	3	2	0	2.1	61	1.8
6– 7	17	11	7	1	0	1	0	0.9	3	2	3	2	1	0	0	1.6	48	1.1
4– 6	10	1	0	0	0	0	0	0.1	9	1	2	0	0	0	0	0.5	23	0.3

SOURCE: *Cron and Pronko, 1957, p. 35.*

for both boys and girls until ages eleven to twelve. There is a gradual falling off from that age onward for both boys and girls—somewhat more apparent for the girls than the boys. The researchers pointed out that the girls at age thirteen and above appeared more self-conscious than did younger girls or boys while performing the task. Therefore, the results for the older girls are questionable. It is interesting, too, that up through age eight the girls had higher balance scores than the boys; thereafter, the boys scored consistently higher than the girls.

Writing Skill

Writing is one of the few activities highly dependent upon motor abilities in which most children receive formal instruction. It therefore should have much more careful investigation than it has received up to the present time. Ames and Ilg (1951) reported the developmental trends in writing behavior of younger children. Some of them are as follows:

SIX YEARS

Circle is now drawn counterclockwise, starting at the top.

Letters are printed, usually large and somewhat irregular.

Words are printed by some children at this age. Some reversals of single letters or order of letters in words may appear.

Name is printed in large letters.

Numbers from 1 to 20 or higher are written; some reversals of 3, 7, 9.

SEVEN YEARS

Words: The majority can now write, although an appreciable number prefer to print. The printing is now smaller and more regular.

Name: The majority can now write their given names and surnames; most still print.

Numbers: The majority write 1 to 20, with the figures now written smaller and in rows.

EIGHT YEARS

Words: The majority write single words, printing seldom being used. Important individual differences in writing skill are discernible. Reversals seldom appear.

Name: Nearly all write both their names, well spaced and small letters other than the initial letter of each word. Important variations in style of writing appear.
Numbers: Figures are much smaller and better spaced; few errors are made.

NINE YEARS

Words: Writing is smaller, neater, lighter, more even and slanted, though some still write straight up and down and about one-third still have very irregular letters. Letters are now much better proportioned.
Name: Beginning of individual styles, with sex differences being observed. Letters are more evenly made and more correctly proportioned.
Numbers: Numbers are now small and well formed.

[Ames and Ilg, 1951, pp. 32–34]

The above gradients in writing, like the curves that show the development of various psychomotor abilities throughout this section, conceal individual differences among the children at various age levels and do not present the wide overlapping between best and poorest performers at various ages. For example, Cron and Pronko (1957) found that some seven-year-olds performed better than thirteen-year-olds. As was shown also in Figure 3.8 of Chapter 3, the strongest child at 125 months of age was almost three times as strong as the weakest, and the number of letters written per minute in a handwriting test ranged from 5.4 to 98.0. It will be recalled that the range of intelligence of these subjects was from 56 to 146 and that the low IQ children were enrolled in special classes for the educable mentally retarded.

CHARACTERISTICS OF SKILLED PERFORMANCE

The highly skilled performance, in comparison with the less skilled, is accomplished in less time, with less energy, with greater accuracy, with higher consistency, or with more flexibility; and in some skills all five are essential. We anticipate that fifth-graders, having developed better handwriting skill than third-graders, will write the same amount of material in less time, with less energy expenditure, with greater accuracy, with higher consistency from one word to the next, and with greater flexibility in responding to a variety of writing tasks. Similarly, the person skilled in using a dictionary as compared with the beginner finds words in it in less time and with less energy, makes fewer errors or unproductive tries, consistently finds the words he seeks, and responds with more flexibility to a larger variety of words.

How do we explain differences in performance between the more skillful and the less skillful individuals? Generally we do so in such terms as (1) better differentiation of cues to guide the actions; (2) more rapid trial, correction, and confirmation of responses; (3) more rapid movements or other responses; and (4) more highly coordinated movements or other responses.

Differentiation of Cues

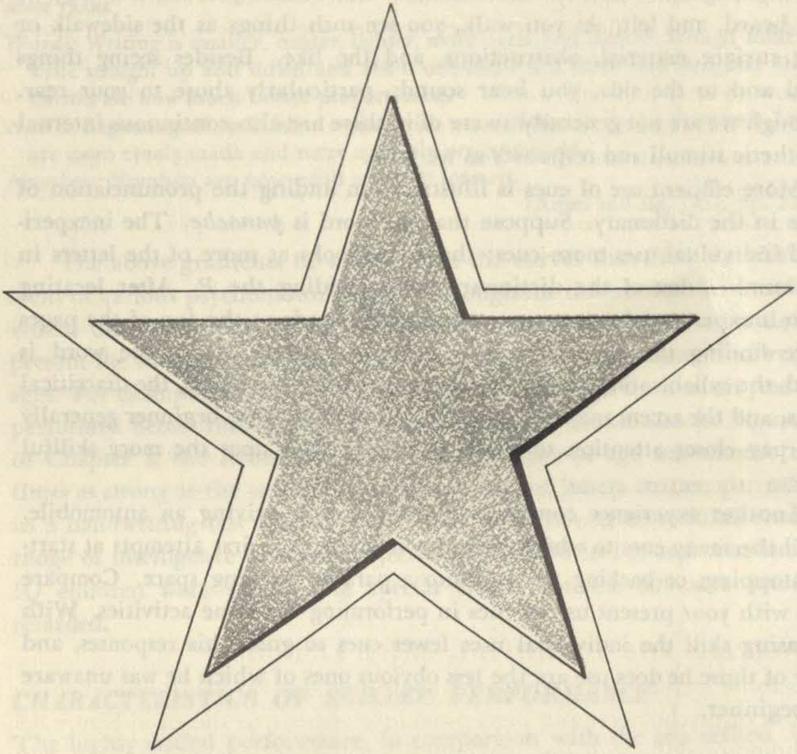
Imagine yourself walking from one place to another. Suppose further that you know the place at which you intend to arrive. The cues which guide your walking are within the environment and within yourself and may be seen, heard, and felt. As you walk, you see such things as the sidewalk or other surface material, obstructions, and the like. Besides seeing things ahead and to the side, you hear sounds, particularly those to your rear. Although we are not generally aware of it, there are also continuous internal kinesthetic stimuli and responses as we walk.

More efficient use of cues is illustrated in finding the pronunciation of words in the dictionary. Suppose that the word is *panache*. The inexperienced individual uses more cues; that is, he looks at more of the letters in the thumb index of the dictionary before finding the *P*. After locating *P*, the inexperienced person uses more guide words at the top of the pages before finding the page on which *panache* appears. Once the word is found, the syllabication found in the phonetic pronunciation, the diacritical marks, and the accent marks must be used correctly. The beginner generally must pay closer attention to these three cues than does the more skillful person.

Another experience common to most of us is driving an automobile. Recall the many cues to which you responded in your first attempts at starting, stopping, or backing the car into a parallel parking space. Compare them with your present use of cues in performing the same activities. With increasing skill the individual uses fewer cues to guide his responses, and many of those he does use are the less obvious ones of which he was unaware as a beginner.

Trial, Correction, and Confirmation

Again referring to the use of the dictionary in locating a particular word, we see that there is not one simple, rapid response unguided by cues. Rather, when the individual locates the page on which the word is, he quickly scans the word entries; while doing so, he is making a very rapid series of trials and corrections before finding and confirming the word desired. Similarly, backing a car into a parallel parking space is not one smooth, simple action. Rather, from the time one starts backing until the car is parked, there are very rapid trials and corrections with continuous responding to cues. The finding of the correct word in the dictionary once the page is located is almost totally a mental process, whereas parking the car, though partially mental, can be accomplished only through movements which control the direction and speed of the car. The use of cues and the trial, correction, and confirmation aspects of achieving skilled performances cannot be explained well in words. For a concrete example of this process, the reader might first draw a five-pointed star, place a mirror slightly



5-Pointed Star with Mirror Image

FIGURE 8.4.

above it, and then looking only at the mirror attempt to follow the original outline with his pencil.

Rapid and Accurate Movements

If one could observe highly and moderately skilled typists as they reproduced this page, one would readily observe differences in the speed of hand and finger movements. The typist reproducing at 40 words per minute moves about half as rapidly as the one reproducing at 80 words per minute. There might be the same number of errors in the copy of both individuals. However, we would anticipate that the one with lower speed would either make more errors or else would take more time to strike the correct keys and other parts of the typewriter.

Coordination of Movements and Responses

Quick and accurate movements and other responses occur at precisely the right time in a skilled performance. In such an apparently simple task as writing a sentence legibly, there are many muscular movements and mental responses. The skilled writer does not hesitate about whether or not to capitalize words, how to punctuate, how to join letters within a word, or how to start and end words. As he writes, making rapid changes from vertical to horizontal to circular movements, there is a continuous series of correct movements and other responses coming at precisely the right time. The skilled person writes *women* in such manner that the observer notices only a series of continuous smooth movements with no jerks or stops.

The skilled typist not only has integrated a series of movements and responses to reproduce individual words quickly, but also perceives a relatively long series of words in one visual fixation on the page. One fixation on five or six words provides all the cues needed to reproduce the words. Further, little or no conscious thought is given to such motor acts as striking the space bar, shift key, or the letters. The completing of one word provides the cues for both the spacing and the starting of the next word. Similarly, as the expert typist takes material from a tape recorder, the auditory cues available through listening, and the production of successive words and other symbols, provide the continuous, steady cues essential to rapid production of evenly typed copy with few or no errors.

PRINCIPLES FOR IMPROVING SKILL LEARNING

Skills to be learned in a variety of school situations vary with respect to the amount of psychomotor and perceptual involvement, as shown in Figure 8.5. Psychomotor skills with low perceptual involvement include walking, running, swimming, bicycling, and gymnastics. The cues for the guidance of these skills are largely internal and kinesthetic rather than visual and auditory. Skills with considerable psychomotor and perceptual involvement include typing, playing a musical instrument, and others. In these skills what the individual perceives guides his subsequent movements. Skills with low motor and high perceptual components are found in the language arts. In rapid silent reading, there are such motor skills to be acquired as moving the focus from left to right across the page, moving from top to bottom as successive lines are read, grouping the words to achieve a fast rate of reading, and responding to punctuation marks. The main task in silent reading, however, is perception of words with meaning.

The amount of motor and perceptual learning in any of the skills enumerated varies with the stage or level of skill development. Walking requires more attention to perceptual cues for the beginner than for the older skilled walker, just as attention to the motor acts is less for the skilled

Motor and Perceptual Components of Skills

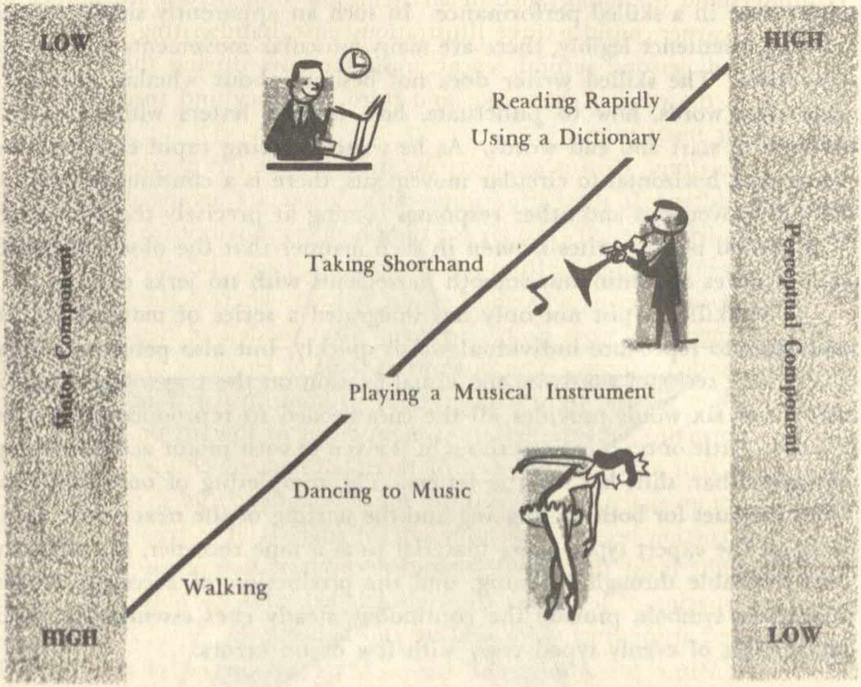


FIGURE 8.5.

than for the beginning typist. The following seven principles are intended to apply to all skills:

1. Analyze the skill before attempting to guide the learner.
2. Demonstrate the correct response.
3. Guide initial responses verbally and, if necessary, physically.
4. Provide for appropriate practice tasks.
5. Distribute rather than mass the practice.
6. Provide knowledge of results and correct inadequate responses.
7. Aid the learner to evaluate his responses.

As with the principles listed in Chapters 6 and 7, here also high motivation, a favorable physical and emotional setting, and adequate provision for individual differences are considered essential for efficient skill learning in group situations. Though the teacher is assumed to be the one who applies each principle while teaching his students, the subsequent discussions are intended to show how the principles may be applied to one's own learning of skills.

1. *Analyze the Skill Before Attempting to Guide the Learner*

To understand the importance of analyzing the skill before attempting to guide the learner consider three illustrations: first, handwriting for left- and right-handed persons; second, vocal music for boys during the adolescent years when the voice is changing; and third, accuracy and speed in beginning typing instruction.

Handwriting. How is handwriting different for left-handed and right-handed children? In most situations seats or desks are arranged so that the light comes from the left—proper for right-handers, but not for left-handers. Since one is taught to write from left to right on a page, the left-handed child is continuously covering what he has just written, whereas the right-hander can see immediately what he has written. Most models of handwriting are for right-handed persons. The downward slant of letters is to the left; this is appropriate for the right-handers, but without instruction, left-handed children normally slant the letters straight down or toward the right. Suppose, then, that a teacher has two or three left-handed children in a class. What sort of an analysis of the skill for the left-handed child should be made before instruction begins? Without careful analysis, it is possible that the teacher might insist that the left-handed children use precisely the same slant and spacing of letters as the right-handed, and do nothing to make other needed arrangements for seating and lighting.

Vocal Music for Adolescent Boys. A recent survey of high school boys and girls participating in chorus groups showed the ratio to be approximately four girls to one boy (Swanson 1959). A primary reason for this imbalance was that music teachers, particularly females, do not recognize the true nature of the singing task for boys going through the period of voice change. Music teachers in the junior high school generally pitch the music too high, select melodies which have far too broad a range for adolescent boys, and give instruction on songs which have little or no interest for boys of this age. Swanson found that a rating of pubic hair was useful for identifying the stage of voice change in adolescent boys. After rating the boys by this criterion, he regrouped junior high school classes for instruction in vocal music. When he arranged proper vocal exercises for the boys, selected interesting songs, rearranged many melodies, and proceeded to instruct them in groups brought together according to stage of voice change, they enjoyed the music activities as much as did the girls. When given the opportunity to volunteer to enroll in a vocal music class in the next grade, they did so.

We do not know how much direct damage to the singing voice and how much lack of interest in vocal music result because teachers do not understand the nature of the singing task for boys from about Grade 5 to 9. Obviously, the female vocal music teacher who has not experienced voice change and who insists that boys handle the same songs as girls is proceeding without accurate knowledge or is not using the knowledge she has.

Typing Instruction. The desired outcome of typing instruction is high speed, accuracy, and smooth, even copy. The question can properly be raised whether speed or accuracy should be emphasized in beginning typing instruction. Early in this century, accuracy was emphasized. Since 1940 considerable experimentation has been done to appraise the effects of emphasizing speed or emphasizing accuracy in the early phases of instruction in a variety of tasks. From the studies of Green (1940), Solley (1952), and West (1953), one may conclude that both speed and accuracy should be emphasized in early typing instruction. However, in skills in which speed is the predominant factor in later successful performances, speed rather than accuracy should be emphasized in early instruction; in skills in which accuracy is the predominant factor required in later successful performances, attention should be given to accuracy early in the instruction. The research clearly implies that the teacher of any skill must know enough about the nature of the skill to ascertain whether speed, accuracy, or a combination of speed and accuracy is equally critical in later skilled performances.

2. *Demonstrate the Correct Response*

A good demonstration provides an overview of the skill to be acquired and a model to be imitated. The music teacher provides both when singing the melody through before having the children start to sing. In professional and collegiate football, the coaching "team" is comprised of a number of coaches —backfield, line, defense, offense—as many as seven or eight specialists. In part, the team of coaches is needed to demonstrate the particular skills involved in playing particular positions.

Note that Principle 2 suggests that the correct response is to be demonstrated. This assumes that the teacher knows the one correct response or the several possible correct responses and can demonstrate them well. It does not mean, however, that the learner should or can always follow the demonstration precisely; as shown in the previous section, the left-handed child cannot follow the right-handed teacher exactly. In many demonstrations of physical movements, the teacher assumes that no individual will exactly duplicate the demonstration; instead, the learner will be encouraged to try to follow the demonstration and, at the same time, make the needed adaptations in terms of his own characteristics. The teacher knows that, though outstanding performers have some common characteristic movements and form, each is unique.

In certain situations it is appropriate not to demonstrate. If one wishes the learners to come up with new forms or unique expressions, demonstrating a particular form to be imitated does not yield desired results. The teacher of creative dance and the teacher of creative writing can demonstrate what creativity means to them. This demonstration should be simply to illustrate what creativity or appropriate expression is for the demonstrator. In art instruction a number of technical skills should probably be demonstrated and the learners should be helped to acquire them. However, when the individual is to develop his own art product, it is impossible for the teacher to demonstrate the learner's final product. The art teacher will perhaps suggest some possible themes and will help the student with the technical skills as necessary, but he will leave the main use of ideas, composition, and color to the learner.

3. Guide Initial Responses Verbally and, If Necessary, Physically

The idea that skill learning requires activity on the part of the learner is widely accepted. So widely is this accepted that some teachers simply tell the learner to write more rapidly and legibly, or to type more rapidly and accurately, or to throw the bowling ball with greater force and with more accuracy. After this telling, nothing is done to guide the learner. Three investigations are now discussed which show quite clearly that verbal instructions to guide the learner's responses are helpful.

Davies (1945) divided an archery class of college women into an experimental and a control group. The experimental group was taught an accepted technique of shooting a bow and arrow and was referred to as the tuition group. The experimenter gave the tuition group the verbal instructions that she thought necessary for them to understand the nature of the skill and to become proficient in it. The women in the control group were given only the necessary equipment, minimum safety instructions, and thereafter proceeded on their own. Both groups met for eighteen class sessions during a three-month period. At the end of the semester the tuition group performed better than the control group. Differences favoring the tuition group were apparent early in the semester and became greater as practice progressed. The control group tended to acquire an inefficient method and to stay with that method during successive class periods even though its progress was poor.

Davies concluded that in at least three ways the teacher aids the learner to vary and improve his learning behavior: by directing the learner's attention to more adequate techniques than those he has acquired and has been employing; by promoting the growth of intellectual insight on the part of the learner into the factors related to his success, and by giving him a feeling of security and confidence in relinquishing a familiar mode of behavior and seeking one that is better. These three conclusions of Davies suggest quite adequately the purpose of providing verbal and, if necessary, physical guidance of the learner's activities while he is developing a skill.

Waterland (1956) verified the idea that the learner can be given verbal instructions for mental practice of a skill with effective results. Under the older system of teaching women students bowling at the University of Wisconsin, the usual verbal and manual instructions were given. In Waterland's experiment, however, three types of instruction were given with successive groups of students to encourage mental practice on the task. The first method was to have the mental practice in connection only with the arm swing in bowling. Before each attempt the student was instructed to think about such things as, "Let the arm go with the weight of the ball; resist the weight of the ball during the backswing by leaning forward from the ankle joint; follow through with the arm in the desired direction of the ball." This mental practice did not lead to the desired smooth, continuous pattern of movements.

With a second group and method, the instructions were expanded by preceding the suggestions above with, "Imagine or concentrate on a continuous movement pattern." With the third group and method the same instructions for mental practice were given. However, the bowling pins were placed at the end of the alley during the second week of instruction; this had not been done under the first two methods. Placing the pins in the proper position appeared to have the important psychological effect of giving further purpose to the practice. Though no more time was spent in practice by the second and third methods, efficiency in bowling increased by about one-third over the original method of instruction without mental practice.

Twining (1949) had three groups of men college students practice tossing rope rings on a target under three conditions: one group threw 210 rings on the first and twenty-second days only; a second group threw 210 rings on the first day, 70 rings on each day from the second through the twenty-first days, and 210 rings on the twenty-second day; the third group threw 210 rings the first day, mentally rehearsed the first-day activity for fifteen minutes daily from the second through the twenty-first days, and then threw 210 rings on the twenty-second day. Thus the first group had no practice between the first and the twenty-second day; the second group had overt practice every day; and the third group had overt practice on the first and twenty-second day only, with mental practice each day between the first and twenty-second day. From the first through the twenty-second day, the first group increased their scores by 4.3 percent, the second by 137 percent, and the third group by 36.2 percent.

4. Provide for Appropriate Practice Tasks

What are appropriate practice tasks? The appropriateness depends upon such factors as whole-part arrangements, the context in which the task is presented, and the type of response to be tried out during the practice. Each of these factors needs further clarification.

Whole-Part Arrangements. There is much disagreement about what constitutes a whole and a part for most learning tasks. Part of the disagreement originates in that what might be a whole skill for a beginner is a part skill for a more skilled performer or vice versa. Another difficulty lies in the organization of the within-tasks in many games and sports. For example, what is the total task in playing baseball? Is the total task that of hitting, running, catching, and other skills? Is batting a separate whole skill or should it be further broken up into a number of smaller parts which in turn might be called wholes?

One way to look at the whole-part arrangement is in terms of the organization of the activity itself. Some activities are closely knit; others are loosely organized. Diving is a closely knit skill, whereas football and baseball are loosely organized aggregations of skills, each of which must receive concentrated practice. Though a final definition of wholes and parts cannot be clearly delimited for all skills, three of many studies which suggest the importance of beginning practice on the whole activity are now examined.

Knapp and Dixon (1952) used three groups of university senior males to test three conditions of practice in juggling three balls. One group practiced using the three balls from the start and, thereafter, a whole method of instruction. A second group practiced according to a prescribed procedure of progressive part-whole method: first, one ball was used until it could be caught, then two balls until both could be caught, and then three balls. The third group was permitted to use one, two, or three balls as the members chose. The whole method proved definitely superior to the rigidly scheduled part-whole method, with about a 20 percent saving in time needed to reach the criterion of one hundred consecutive catches. The whole method also yielded somewhat better results than did the free-choice part-whole method.

McGuigan and MacCaslin (1955) investigated whole and progressive-part methods in rifle marksmanship. The subjects were infantry trainees in army basic training. In the part method, practice was divided into seven components of firing, and the general procedure was to practice the first subtask, then the second, and then combine the first with the second. The third subtask was practiced next and was then combined with the first and second, and so on until, eventually, the seventh was combined with the first six.

In the whole method, the subjects first watched a half-hour demonstration of the entire sequence of seven movements, from assuming a well-defined posture for firing to actually squeezing the trigger. Thereafter, this group practiced the total sequence in each of twenty-eight practice periods, with instruction given on the subtasks as well as on the whole sequence during each practice period. The first group, using the part method, did not get to the seventh step—actual firing—until the twenty-fifth practice period, having spent the first twenty-four periods on the six parts leading up to actual firing. The whole method produced considerably better results. For trainees with IQ's 100 and above, the whole method was far superior to the part method; practice of the total act in each practice period provided for distributed practice on the parts. For trainees with IQ's 99 and below, only a small difference was found between the two methods.

Woodworth and Schlosberg (1954) give an excellent review of experiments completed from 1890 to 1952 in connection with learning to receive International Morse Code. In World War II there was much opportunity, as well as great need, to try out efficient methods of teaching Morse Code. Among several features that were finally incorporated into the military teaching procedures, four are appropriate to the present discussion of skill learning: prompt reinforcement of the correct response, the whole method of teaching, a standard-speed presentation of signals, and distributed practice. In the whole method all thirty-six symbols of the code—twenty-six letters and ten digits—were introduced to the learners in the first practice session. This method contrasted sharply with previous ones wherein early instruction was devoted to lengthy practice on separate symbols (similar to the progressive-part method in rifle firing just mentioned). The application of our best information about skill learning led, in this case, to the following dramatic results:

> Students spent 8 weeks at code school. Normally, they practiced code for 7 hours a day for the first 5 weeks, and devoted the last 3 weeks to other topics. Keller thought such massed practice might be wasteful, so he tried spreading out the code instruction over the whole 8 weeks, devoting 4 hours daily to code, and the rest to other topics. It turned out that the 4-hour group was as good as the usual 7-hour group at the end of 5 weeks, despite the shorter hours of practice. Of course they still had 3 more weeks to practice code, for they had been taking up their other topics along with the code; they ended up markedly superior to the massed group [Woodworth and Schlosberg, 1954, p. 812].

The Context for Practice Tasks. It is not uncommon to find that some students who perform well in typing or shorthand in school are less proficient in these same skills in a regular office job after graduation. The classrooms in which the skills are developed are very different from the offices in which the skills are performed after graduation. Practice is not usually arranged in the context in which the skills will be used after graduation.

Many schools have overcome this difficulty by two methods. First, an office practice class is offered. In it students carry out, in connection with the school's correspondence, duties similar to those they will perform after graduation. The room for the office practice class resembles general offices, with the usual filing cabinets, desks, typewriters, and other office equipment. By a second procedure the high school student goes into office work in a local business or other establishment for part of his instruction. In this manner he gets experience in the situational context in which the skills are actually used. Generally, these two procedures result in better performances after high school graduation, especially in the first weeks on the job.

Consider now other illustrations of the proper context for practice, The value of interneship has been clearly demonstrated in medical education. Also, student teaching, in which the student teacher leaves the college or university for several weeks to a year to perform the duties of the regular teacher throughout the school day, is a form of interneship different from and better than verbal classroom instruction about student teaching. Interneship in the teaching profession is probably as useful as interneship in the medical profession. In any event, the more nearly the practice of complex skills is similar to the situations in which the skills are actually to be used, the more efficient the results. The medical interne, the teaching interne, and the student secretary "practice" more realistically than do most students in a regular classroom setting.

Variety of Responses. Blind adherence to a particular method or to a specific use of material—functional rigidity—was previously shown to interfere with efficient problem-solving. It also interferes with skill learning. Even though the teacher thinks he knows the best approaches, he should reexamine them if his students do not make progress after repeated and consistent efforts. Students should be encouraged to try some other method, even though the teacher might not be aware of what it may be.

After working individually with a child from fifteen to twenty minutes daily over a period of several weeks, only to find that the child is no better than when he started, the teacher should rightfully conclude that something is wrong with his method or that the child does not possess the essential abilities to profit from practice. Distributed practice, using a variety of methods, will usually produce the best results.

5. Distribute Rather Than Mass the Practice

The dramatic results in learning Morse Code achieved through distributed practice were discussed in the previous section. Distributed, rather than massed, practice yields more efficient learning of motor skills which require a low degree of perception, and of skills requiring a high degree of perception and a low degree of motor activity. Representative studies on which this principle is based are presented in the next paragraphs; applications to usual classroom learning arrangements follow.

Knapp and Dixon (1950) studied the effect of two different distributions of practice on efficiency in learning to juggle three balls. The experimental and control groups were male seniors with majors or minors in physical education. Both groups used the whole method. The distributed-practice group used five minutes in active practice daily; the massed-practice group used fifteen minutes on alternate days. Individuals in each group practiced until they could catch 100 balls consecutively without dropping one. The distributed practice yielded much better results: 70 minutes were used by the distributed-practice group, whereas 126 minutes were used by the massed-practice group to reach the same level of skill. One minute of practice in the 5-minute daily arrangement proved as effective as 1.80 minutes in the 15-minute, alternate-day arrangement. Though this was the case, fewer 15-minute than 5-minute practice sessions were required to achieve the criterion of 100 catches without error.

The above study was replicated with high school freshmen boys by Knapp, Dixon, and Lazier (1958). The same results were found; the 5-minute daily practice arrangement produced more efficient learning than did the 15-minute sessions on alternate days. The high school students under both arrangements were found less efficient than the university seniors; however, the differences were quite small. An unexpected difference was found between the two groups: many more high school freshmen than university students could not achieve the criterion of 100 consecutive catches, but there was no difference between the two groups in achieving 25 consecutive catches. The researchers could not determine why making 100 consecutive catches was more difficult for the high school students.

In the two preceding studies, the rest intervals between practice sessions were about 24 and 48 hours respectively. Ammons (1950) studied the effects of varying length of rest intervals on a relatively simple motor task that required the individual to keep a small stylus on a constantly moving target—a rotor-pursuit task. In this investigation the length of practice sessions was 20 seconds. The times between practice sessions were 0 seconds, 20 seconds, 50 seconds, 2 minutes, 5 minutes, 12 minutes, and 24 hours. Depending upon different arrangements within this experiment, the rest intervals of 20 seconds to 2 minutes resulted in greater achievement than did the shorter interval of 0 seconds and the longer intervals of 5 minutes or more.

Also using a rotor-pursuit task, Duncan (1951) ascertained the extent to which intervals of rest could be directly substituted for intervals of practice with no reduction in the final level of learning achieved by undergraduate college women. The entire experimental session took only 20 minutes, divided as follows: 5 minutes prerest practice, 10 minutes rest, and 5 minutes postrest practice. During the 5-minute prerest period, two of the groups worked under distributed practice conditions with 10 seconds practice, 20 seconds rest, 10 seconds practice, and so on. The other groups worked under massed practice with continuous practice for 5 minutes at the beginning and the end of the 20-minute session and 10 minutes of rest between. The distributed practice was so arranged that the two groups receiving it practiced only one-third as much as did the massed practice group. In the last 5 minutes one of the original distributed-practice groups was given massed practice and one of the massed-practice groups received distributed practice. At the end of the first 5 minutes of practice, the distributed-practice groups were performing better, even though they had only one-third as much actual practice time. At the end of the 10-minute rest session, the distributed-practice groups were the same; however, the one which then received distributed practice performed significantly better than did the massed-practice group. Although this entire experiment was conducted within a time period of 20 minutes, it poses significant questions about the proper spacing of active practice and rest in many school learning activities such as handwriting, typewriting, and instrumental music.

Teachers in junior and senior high schools usually have no control over the length of class periods. They work in schools where class periods in all subject fields are of the same length, usually from 45 to 75 minutes. In any subject where skills are part of the desired outcome the teacher should raise questions such as these: Within a class period of this length what is the best arrangement of active practice and rest? What is the best arrangement of active practice and rest for a beginning class? For an advanced class? Will the students acquire skill more rapidly through active practice each day of the week or through active practice on alternate days?

In the elementary school, teachers have more opportunities to manipulate time arrangements, since elementary schools are not so completely departmentalized as are junior and senior high schools. The elementary teacher has better opportunity to experiment with a variety of practice-rest arrangements. In the fourth grade, for example, experimenting could be done to ascertain whether children learn to spell as efficiently with 15 minutes of active practice on alternate days as with 15 minutes daily. When cursive handwriting is introduced, a test could be made to find whether 20 minutes of practice in four spaced 5-minute sessions during the school day would achieve the same or better results than 20 minutes at one time during the school day. Most teachers simply accept the arrangement that someone, without evidence that it is the best one, has previously set up. We know, however, that the practice session must be sufficiently long for the learner to identify cues and make progress on the task, and that, after a certain point, further time in practice does not lead to improvement. If it takes at least 5 minutes to make measurable progress in handwriting, then the practice session should not be less than 5 minutes. It is unwise to cut the practice period so short that the learner does not acquire enough to carry the learned skill through to the next practice period.

6, Provide Knowledge of Results and Correct Inadequate Responses

This principle is as thoroughly established as is the previous one, and excellent reviews of the experimental work are found in Deese (1958) and Woodworth and Schlosberg (1954). One reason for the adequacy of experimental results with regard to this principle is that skill learning can be measured quite readily. Walking and running speed can be easily timed. In such physical activities as shooting baskets, throwing or kicking a football, or swimming, for example, it is not difficult for the instructor or the more mature student himself to appraise performances using such criteria as speed, accuracy, and distance. In typing and shorthand, also, results are relatively easy to measure.

Not only is progress in many skills easily measured, but a variety of means is available to the teacher to provide the learner with knowledge of his progress. Information can be given verbally in such simple statements as "correct" or "incorrect"; a verbal analysis can be given of any object which the student has produced; and the results of performance tests of all sorts can be incorporated in charts or given to the student directly. Verbal presentations, however, have some limitations. In some skills, the actions cannot be explained verbally, nor can the accuracy or speed always be measured. In this case the teacher may demonstrate and the student, by observing, can compare his performance with that of the teacher. As was suggested previously in several studies, the learner can also be encouraged to engage in mental practice of the task both before and after he has completed it. This mental practicing is sometimes useful in helping the learner to intellectualize knowledge of results both with respect to ascertaining what he has done well and, possibly, where he has made an error.

Incorrect responses or poor movements should be corrected immediately. A primary determiner of the efficiency with which pupils acquire any skill is the quality of the help given at the time incorrect movements or responses are made. As was shown previously in Chapter 6, when the learner unknowingly misspells a word he tends to repeat the incorrect spelling. Similarly, if the individual performs a bodily movement incorrectly, he tends to repeat it. In some cases individuals overcome their deficiencies independently. In many cases, however, learning progresses only when the inadequacy is identified and appropriate methods are used to overcome it.

7. *Aid the Learner to Evaluate His Responses*

This principle applied to the learning of skills carries the same meaning that it does to other learning outcomes as treated in Chapter 6 and 7. Under the direction of the teacher, the learner has the opportunity to profit from the guidance provided. Most skills, however, eventually are performed independently, and the purpose of teaching skills in school is so that learners can use them independently in school and in many activities outside the school. Besides the guiding and monitoring of active practice in school, there should also be discussion and analysis whereby the learner acquires skill in evaluating and improving his performances independently. It is entirely possible that no person will acquire a high degree of skill so long as he remains completely dependent upon someone else for the guidance and monitoring of his activities.

SUMMARY

Progress is being made in identifying psychomotor abilities. Factors generally accepted as contributing to one or more skilled performances are strength, impulsion or reaction time, speed, precision, coordination, and flexibility. The extent to which these factors are related to performance in handwriting, typing, playing a musical instrument, etc., is not clearly established for two main reasons: lack of research and the importance of cognitive abilities and affective characteristics in these performances.

Skilled performances vary in the amount of psychomotor and perceptual involvement. Walking is heavily psychomotor and low perceptual; using a dictionary to find correct pronunciations and spellings is heavily perceptual and low psychomotor. The amount of perceptual or motor involvement in a skill in part depends upon the level of accomplishment of the individual. However, any skilled performance is characterized by rapid differentiation of cues, rapid trial and confirmation, rapid and accurate movements, and coordinated movements and responses. The learning of skills is improved through analyzing the skill before attempting to guide the learner, demonstrating the correct response, guiding initial responses verbally and (if necessary) physically, providing for appropriate practice tasks, distributing rather than massing the practice, providing knowledge of results and correcting inadequate responses, and aiding the learner to evaluate his responses.

QUESTIONS AND ACTIVITIES

1. (a) To what extent are psychomotor abilities necessary for the maintenance of one's own life? For the enjoyment of daily activities?
   (b) List any cultural artifacts that required a low level of psychomotor abilities in their production. A high level.
2. Briefly discuss problems of predicting success in skill learning based upon the Fleishman and Woodrow studies.
3. (a) State two or three conclusions about developmental trends in each of the following: strength of grip, reaction time, speed, balance, and handwriting.
   (b) Which ability do you think is most, and which least, dependent upon instruction for its improvement? Give the basis of your opinion.
4. (a) List and discuss the characteristics of a skilled performance.
   (b) Identify a skill which you perform frequently but have not improved recently, e.g., handwriting or playing a musical instrument, and indicate why there has been no improvement.
   (c) Demonstrate a skilled performance to someone and describe it in terms of the characteristics in (a).
5. Why is it important to analyze a skill before attempting to teach it to someone?
6. When should the teacher not demonstrate a skill to a beginner?
7. Discuss the effects of verbal guidance, physical guidance, mental practice, and overt practice in the learning of a psychomotor activity such as bowling.
8. For a skill in which you are most proficient or for one you may teach others, discuss practice tasks from the standpoint of:

(a) whole-part arrangements;
(b) context;
(c) variety of responses.

9. (a) With what types of skills does distributed practice yield better results than massed practice? Give examples.
   (b) When is a practice session too short?
   (c) When is a practice session too long?
   (d) To what extent is desirable length of practice sessions dependent upon the characteristics of the learner and the nature of the task? Give examples.
10. Under what conditions does knowledge of results facilitate skill learning?
11. List three of your skills that you could improve without instruction from another person. In one of these, describe how you would go about it.
12. Compare the principles for learning skills with those for learning concepts from the standpoint of their foundations in research.

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Chapter 9 Affective Outcomes I: Attitudes and Values

What attitudes and values should children learn in school? How are attitudes and values acquired? The answers to these questions are less clear than are answers to similar questions dealing with psychomotor skills and knowledge. Agencies such as the home and church supposedly are more responsible for attitude learning than for psychomotor and cognitive outcomes. Also, there is considerable disagreement among people in most communities as to which attitudes and values should be acquired by children and youth; therefore, the school has difficulty in deciding which set of conflicting attitudes and values to incorporate in the school curriculum.

This chapter assumes that the learning of attitudes and values is an important objective of the school, as is shown in these main topics: (1) the nature of tastes, attitudes, and values; (2) developmental trends in attitude learning; (3) principles for facilitating the learning of attitudes; (4) dealing with extreme attitudes.

THE NATURE OF TASTES, ATTITUDES, AND VALUES

An attitude is a learned, emotionally toned predisposition to react in a consistent way, favorable or unfavorable, toward a person, object, or idea. An attitude of an individual is inferred from his behavior and cannot be measured as directly as skills, facts, and concepts. The main difference between a concept, as defined in Chapter 7, and an attitude is that the attitude influences the individual's acceptance or rejection of persons, things, and ideas hereafter referred to as the attitude object. An attitude has meaning for the individual, as does a concept.

As shown in Figure 9.1, there is no sharp dividing line or distinction between tastes or preferences, attitudes, and values. From the standpoint of stability, tastes are most temporary and values are most stable, with attitudes somewhere between. Tastes may shift readily from day to day or week to week, attitudes change less frequently, and values are quite resistant to change. Tastes are in connection with something specific, such as like or dislike of a particular animal, color, or flavor; values are more general and encompass large areas of experience. We might thus think of a *taste* as applying to a specific treatment of a musical composition, an *attitude* to acceptance or rejection of certain categories of music such as sacred, classical, or modern, and a *value* to the entire scope of music in the life of the individual.

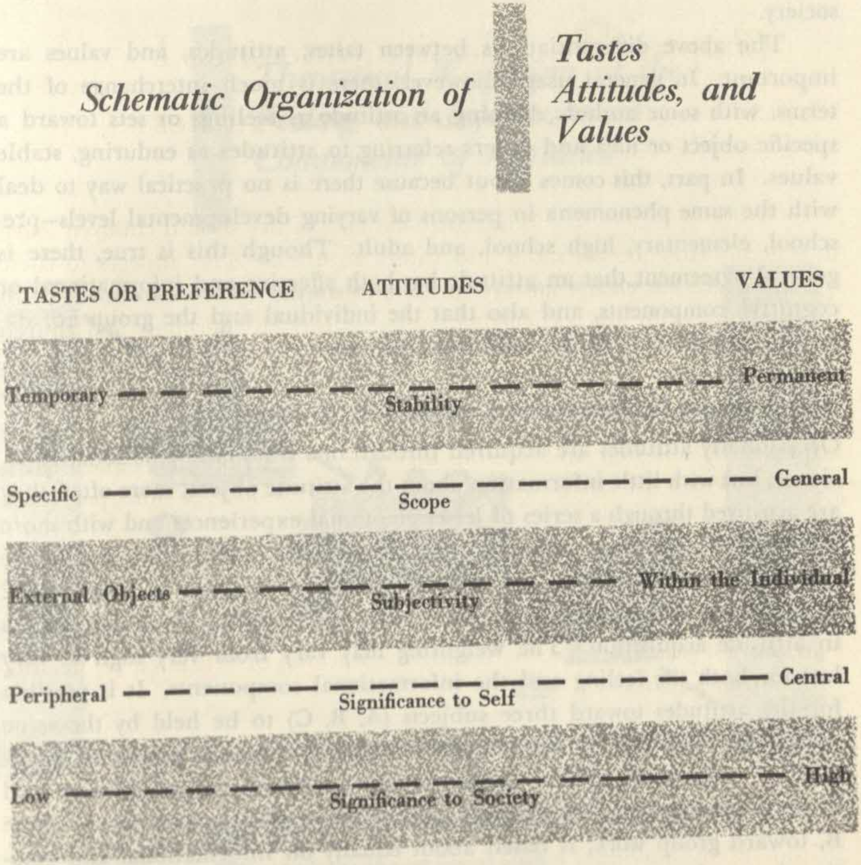

FIGURE 9.1.

In connection with the subjectivity dimension shown in Figure 9.1, we usually think of the external object itself as being attractive or unattractive to the individual as the basis for a taste; attitudes are involved in the relationship between a person and the external object or event; and values more intimately inhere within the individual. As applied to significance to the self, an individual's tastes may change without much modification in his total personality or self-organization. Attitudes can also change, but with many attitude changes there is also change in the self; and with large and significant changes in the value system, there is also basic change in personality. On the last dimension—significance to society—tastes are not considered of high importance, being unique to individuals within the larger social group. Values, however, are of high importance to organized segments of society, such as the community, state, and nation. Large differences in values or in the means of achieving the same values by subgroups within the community or nation result in conflict and disorganization of the larger society.

The above differentiations between tastes, attitudes, and values are important. In general usage, however, there is much interchange of the terms, with some authors defining an attitude as feelings or sets toward a specific object or idea and others referring to attitudes as enduring, stable values. In part, this comes about because there is no practical way to deal with the same phenomena in persons of varying developmental levels—preschool, elementary, high school, and adult. Though this is true, there is general agreement that an attitude has both affective and informational or cognitive components, and also that the individual and the group are important determiners of the attitudes acquired.

Affective and Informational Components of Attitudes

Occasionally attitudes are acquired through one traumatic emotional experience, but with little information about the attitude object; more often they are acquired through a series of lesser emotional experiences and with more information; some are acquired with considerable information about the attitude object and little accompanying feeling or emotion. Figure 9.2 shows theoretical weightings of the feeling and informational components in attitude acquisition. The weighting may vary from very high to very low for both the feeling and the informational components. It is possible for the attitudes toward three subjects (A, B, C) to be held by the same individual. Attitude A, toward denominational religions, might be favorable or unfavorable and is based largely on emotional experiences and little on informational experiences with denominational religions. Attitude B, toward group work, is based about equally on informational and emotional experiences with group work. Attitude C, toward research into the causes and cures of diseases, is heavily based on informational experiences with a relatively low degree of emotional experience.

In general, commercial advertising uses the "A" approach, whereas schools use the "C" approach. The advertiser, wishing individuals to acquire a favorable attitude toward a product, presents it in a most pleasant emotional setting with a minimum amount of information, all favorable. If the teacher wishes individuals to acquire an attitude without attempting to influence the accepting-rejecting dimension, he gives all information—favorable, unfavorable, and neutral. But whether an attitude is acquired primarily as a result of emotional or informational experiences, it serves to guide the individual's behavior in a rather consistent way in particular situations.

For example, if the individual has a strong negative attitude toward denominational religions, he probably will not attend church regularly or, if so, will not go for the same purposes as most church members. If he has a strong positive attitude toward research into the causes and cures of disease, he will probably contribute to various fund-raising campaigns to extend medical research. It is possible, of course, for the individual to have attitudes that present contradictions in some situations. One may have a strong antimedical attitude toward the treatment of illness and a strong positive attitude toward the curative powers of faith; however, when the appendix ruptures, this individual may behave in a manner contrary to one attitude or the other.

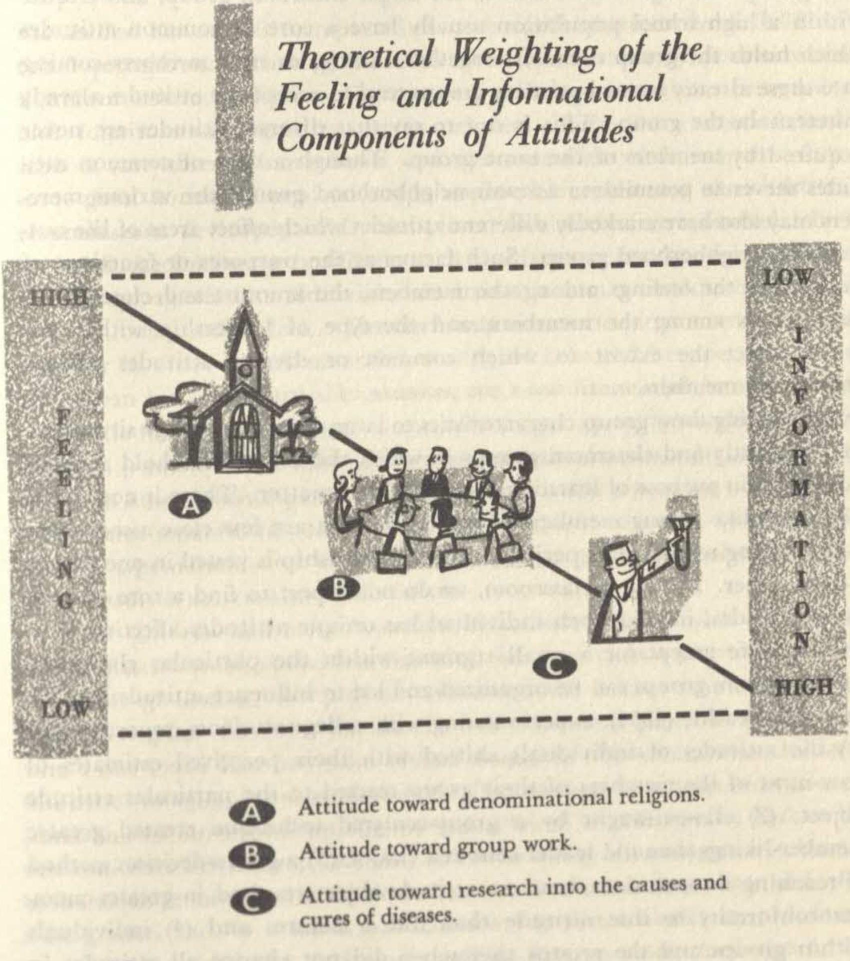
Theoretical Weighting of the Feeling and Informational Components of Attitudes
HIGH
FEELING
LOW
LOW
INFORMATION
HIGH
A
B
C
A Attitude toward denominational religions.
B Attitude toward group work.
C Attitude toward research into the causes and cures of diseases.

FIGURE 9.2.

Individual and Group Bases of Attitudes

Just as an individual acquires his own facts and concepts, so also he acquires his own attitudes. However, membership in groups, and particularly in primary groups, exercises an important influence on attitude acquisition more so than on concepts and psychomotor skills. The family, the neighborhood play group, the high school crowd, the larger classroom group, and cliques within a high school population usually have a core of common attitudes which holds the group members together. Young or new members coming into these already formed primary groups tend to accept the attitudes already inherent in the group. This is not to say that diverse attitudes are never acquired by members of the same group. Though a core of common attitudes serves to consolidate a small neighborhood group, the various members may also have markedly different attitudes which affect areas of life outside the neighborhood group. Such factors as the purposes or functions of the group, the feelings among the members, the amount and closeness of associations among the members, and the type of leadership within the group affect the extent to which common or diverse attitudes emerge among the members.

Applying these group characteristics to large classes in college situations, we frequently find classroom groups in which the individuals hold a vague but common purpose of learning certain subject matter. There is not strong like or dislike among members of the class, there are few close associations made during regular class periods, and the leadership is vested in one person —the teacher. In such a classroom, we do not expect to find a core of common attitudes; instead, each individual has unique attitudes affecting most areas of life except for a small segment within the particular classroom. But classroom groups can be organized and led to influence attitude acquisition. McKeachie (1954), experimenting with college students, reported that (1) the attitudes of individuals shifted with their perceived estimates of how most of the members of their group reacted to the particular attitude object; (2) classes taught by a group-centered technique created greater member-likings than did leader-centered classes; (3) a group-decision method of reaching a conclusion about an attitude object resulted in greater member conformity to that attitude than did a lecture; and (4) individuals within groups and the groups themselves did not change all attitudes in the same manner—certain attitudes apparently were more resistant to modification than others. The importance of the group and of group management in the acquisition and modification of attitudes will be given more consideration in later discussion.

DEVELOPMENTAL TRENDS IN ATTITUDE LEARNING

Much remains to be learned about the acquisition and change in attitudes from infancy into adult life in the same individuals and groups. Some attitudes appear to be acquired in early childhood and remain fairly stable thereafter; others are not acquired until considerably later in adolescence and are readily subject to modification. We turn now to some investigations which cover three school levels: elementary, high school, and college.

Elementary School Years

Estvan and Estvan (1959) reported their comprehensive study of children's social perception, including attitudes toward a number of pervasive and significant attitude objects. Eighty-seven children, forty-three first-graders and forty-four sixth-graders, were included. Forty-four attended rural schools, forty-three urban schools; and there were forty-four boys and forty-three girls. A unique projective-type approach for securing the children's responses was developed. Fourteen pictures or scenes were devised which included the following: a village, a city, a farm, a factory, a mansion, a poor house, a resort, an old beach, a bedroom, a dam, a church, the Capitol, a schoolroom, and a dock. The first four scenes or pictures were treated together in order to get an understanding of how children perceive rural and urban life situations; the mansion, the poor house, the resort, and the old beach were grouped together in order to get an understanding of how children perceive social-status situations; and the last six were grouped to ascertain how children perceive child and adult life situations. Each child made three separate responses to each picture; his responses were tape recorded, typewritten, and then analyzed. Other techniques also used are not central to the results which follow.

The children had more favorable attitudes toward rural than toward urban situations. Most children regarded the country as a place where they could go sight-seeing, ride ponies, roam about the fields, with many opportunities to play. In contrast, the city was seen as a place of excitement where one could take bus rides and go shopping. However, most children did not associate going downtown or to the city in general with recreational pursuits, and for some shopping was regarded as something that had to be done—a chore interfering with play activities. The first-graders were found to have more negative attitudes toward urban situations than did the sixth-graders and, to a lesser extent, more negative attitudes toward rural situations than did the sixth-graders. The Estvans interpreted the more general negative or mixed feelings on the part of the first-graders as associated with lack of understanding or knowledge of the situation. Neither sex nor intelligence was found to affect attitudes toward rural and urban life situations; boys and girls at both grade levels and children of high and low intelligence at the same grade level responded attitudinally about the same.

The children's responses to pictures of the mansion, the poor house, the resort, and the old beach led to a number of conclusions about attitudes toward social-class status. First, negative attitudes toward lower-status living were acquired before the children reached first grade and remained relatively unchanged through the sixth grade. The pictures depicting lower-class scenes evoked almost the same emotional responses from the first- and sixth-graders, and the number of positive, neutral, negative, and mixed attitudes was about the same in the first- and sixth-grade groups. Second, children acquired favorable attitudes for upper-status living during the first six years of school. The sixth-graders showed many more positive and many fewer negative attitudes toward upper-status living as represented in the picture of the mansion and of the resort than did the first-graders. Third, though boys and girls had similar attitudes and feelings about lower-status situations, the girls were more attracted to more upper-status situations than were the boys. The Estvans interpreted this to mean that the girls were more socially responsive and had internalized attitudes and values at a younger age than boys. Fourth, no differences were found according to attendance in rural and urban schools or according to high and low intelligence in the children's perception of social status.

Of the results from use of the scenes depicting the bedroom, the dam, the church, the Capitol, the dock, and the schoolroom, only attitudes toward the schoolroom are given. Positive attitudes toward the schoolroom were expressed by 49 percent of the children, negative attitudes by 20 percent, mixed attitudes by 22 percent, and no expression of attitude by 9 percent. Only one of the fourteen pictures, that of the poor house, elicited a greater number of negative responses. Though there were negative and mixed attitudes toward the schoolroom. the children expressed only favorable attitudes toward learning itself as one aspect of the schoolroom situation. When given the choice of selecting the picture most preferred, the first-graders most frequently selected the schoolroom; the sixth-graders, on the other hand, selected seven other pictures as more preferred than the schoolroom. For all children the schoolroom ranked third as the most preferred picture and second as the least preferred. The Estvans interpreted the increased unfavorable attitudes toward the schoolroom by the sixth-graders as follows:

> Vacillating between child and adult roles, there is both a resistance to symbols of authority as represented in the school, and a negation of childish things associated with "grade" schools. Furthermore, their quest for new experiences and expanding interests may come in direct competition with school concerns which have lost much of their novelty by this time. This lessening of enthusiasm for school may also be an outcome of the kinds of experiences the child has had in school some of which, apparently, have not kept the original flame burning as brightly as before [Estvan and Estvan, 1959, p. 223].

The above conclusions suggest that some attitudes, for example, toward social status and rural-urban living are acquired quite early in life and become more fixed with further learning. Other attitudes, for example, toward school, appear less stable and change direction. The precise circumstances associated with the strengthening or the weakening of particular attitudes, not discussed by the Estvans, are difficult to ascertain. Apparently, confirming experiences strengthen, and nonrewarding or negative experiences weaken attitudes.

High School Years

With the individual's increasing age and experience some positive and negative attitudes tend to become more stable and are incorporated into a more generalized value system or philosophy of life. But marked changes still occur during high school years and even in college. Partial results of comprehensive studies by Gesell and Remmers are now given which suggest developmental trends in attitudes from about ages ten to eighteen.

Gesell, Ilg, and Ames (1956) reported their longitudinal study of developmental characteristics of children and youth, ages ten to sixteen. Of the 165 boys and girls in the study, 115 were seen more than four times during ages ten to sixteen; the other 50 were seen only once. This sample was somewhat biased in that the fathers of the children were almost totally in professional or semiprofessional and managerial occupations, with only 7 percent in semiskilled or skilled labor. Further, the mean IQ of the children was about 118. Of the many traits and behaviors studied in the children, one was honesty; three traits associated with honesty were cheating, stealing, and truthfulness. Honesty was treated as one of the five factors associated with ethical sense. Now follow summary statements about growth gradients as applied to cheating and stealing.

10 YEARS

Cheating. Ten has a strict code, and feels that "cheating is awful." Most Tens say specifically that they would not cheat, though a few report one or two children at school who do.

Stealing. No children admit to stealing. Many comment that stealing is very bad. Some might be tempted, but many know they would feel "awful" if they did; others know the consequences would be too bad. Several say they know children who do steal, and remark on the badness of this. . . .

11 YEARS

Cheating. Though stating that they themselves would not cheat, many Elevens show much concern (as did Six) about others who do. Most report that some of the children at school cheat, girls frequently saying that most boys cheat on exams.

Some say they used to cheat when younger, though they no longer do.

Stealing. Most say that they never do, but that they know people (even own twin) who steal either from stores or from their mother's pocketbook. Many are troubled about this, and most comment that it is a bad idea or wrong. One or two admit they used to, but say, "No longer."

From reports other than their own, it appears that more girls than boys are likely to be involved in an episode of pilfering at eleven. . . .

12 YEARS

Cheating. Compared with Ten, Twelve shows a very casual attitude toward cheating. Many say they would not cheat, but others say they might if they had to, and quite a few say that they do ("All the kids do—we help each other out").

Stealing. A similar change appears. Most say that they themselves do not steal. But a few—boys more than girls—admit to occasional stealing, several mentioning the "fun" of it. A great many say they "know kids" who steal, mostly from ten-cent stores, and many add, "They charge too much anyway."

Some seem mildly admiring of others who steal. . . .

13 YEARS

Cheating. Thirteen reports that a few classmates cheat, but most do not. Most 13-year-olds disapprove of others' cheating, and do not admit to doing so themselves —unless there is some good reason.

Stealing. Pilfering from stores is less frequently reported—even in Thirteen's mention of "the other kids." The thrill element is somewhat discounted: "What's the use of going and lifting little whistles?" . . .

14 YEARS

Cheating. Boys and girls have more to say about cheating now than they did earlier. Most feel that there is not too much cheating at school: "I think most kids are pretty honest. A few will cheat if they have the advantage." But the situation clearly differs from school to school, and even from class to class. Some report that "75 to 80 per cent of the kids" cheat; others that school is run on the honor system, and almost no one cheats.

In their own practices, a slightly qualified honesty seems to prevail—some are honest *except* ("except in Latin") and others are honest *if* (if they respect the teacher). Some say it is confusing because some teachers allow you to check your work with other pupils more than others do.

Stealing. As usual, they do not admit to stealing themselves. When discussing others' stealing, Fourteen no longer appears shocked (as at ten) or slightly admiring (as at twelve), but rather understanding: "I think it's something she'll grow out of." . . .

15 YEARS

Cheating. Fifteen seems to feel more strongly about cheating. Most say that they themselves do not cheat, and some say they would rather flunk than cheat. Nearly all state that a few in their class do, but all seem to think this wrong. "I will not help a person who wants an answer."

Stealing. Most of our subjects say not only that they do not steal, but that they do not know anyone who does. Increasingly cited is the concept that it really doesn't pay, because if you steal people don't trust you. . . .

16 YEARS

Cheating. All our Sixteens say they would not cheat in any situation, except perhaps examinations. Here they differ widely. Some say, "Oh, we all cheat in exams," others say they don't know anybody who cheats. Still others say there is no point in cheating except getting better marks, so it's not worth it since "cheating isn't you."

Stealing. As at fifteen, no stealing is reported by our subjects, either by themselves or by acquaintances . . . [Gesell, *et al.*, 1956, pp. 480–483].

Attitudes toward cheating and stealing undergo change from age ten to sixteen, but such change is not a progressive one. At age ten there is a strong attitude against cheating and stealing, but at age twelve both cheating and stealing are not strongly disapproved. By age sixteen these youth, from the backgrounds and with the intelligence levels indicated, frown upon stealing; however, there is still some acceptance of cheating, especially in examination situations.

A very different approach to ascertain the attitudes of high school students has been under way for many years at Purdue University under the direction of Remmers. Remmers secures the opinions or attitudes of students in high schools throughout the nation. In a recent study of how high school youth believe children should be brought up (Remmers and Drucker, 1957), he secured a total of 3000 students from the East, Midwest, the South, and the Mountain and Pacific regions in numbers about proportional to the high school populations of each region. Also, about an equal number of students were sampled from the ninth, tenth, eleventh, and twelfth grades. A ninety-item test was given to the students. Some of the items were largely factual; others were of opinion or attitude type. The test items and the key for scoring were based upon judgments by experts in the fields of child psychology, mental hygiene, parent education, and nursery school education. This permitted comparing the responses of the high school students with those agreed upon by experts.

Table 9.1 shows the responses to six attitudinal items for the total group of high school students, all the boys and all the girls. The high school students were in general agreement with the experts on most of the ninety items. But on the six reported in Table 9.1, the majority of high school students differed with the experts on Items 30 and 52. Fifty-seven percent of high school students agreed that a child should be made to attend church services and 65 percent would punish for swearing, whereas the experts disagreed. On Items 1, 47, 69, and 85 the majority of high school students responded as did the experts. Though results are not given in Table 9.1, there was little difference between the responses of ninth- and tenth-graders and those of the eleventh- and twelfth-graders.

It thus appears that attitudes toward child rearing are quite similar for high school students and adult experts. Whether there might have been higher agreement between the students and their parents is unknown. One might also interpret the information in Table 9.1 as showing considerable difference in attitudes among high school students in that, for example, 57 percent agree and 27 percent disagree to Item 30.

College Years

For several years studies have been under way to increase understanding of the processes of learning and personality development in undergraduate

TABLE 9.1. Responses of 3000 High School Students to Selected Items of Purdue Opinion Panel

Item	Total % Agree	Total % Disagree	Total % ?	Boys % Agree	Boys % Disagree	Boys % ?	Girls % Agree	Girls % Disagree	Girls % ?
1. More important child be emotionally well adjusted than do superior work in school. (A) [a]	75	8	17	72	9	19	79	6	15
30. Make child attend church services. (D)	57	27	16	55	27	18	58	26	16
47. Child needs to learn when, what, and how to fight. (A)	68	17	15	74	12	14	64	20	14
52. Should punish child for swearing. (D)	65	19	16	62	21	17	70	16	14
69. Provide special classes for dull and superior students. (A)	68	19	13	62	22	16	73	17	10
85. Give child regular allowance. (A)	80	10	10	74	14	12	83	8	9

[a] Letters in parenthesis at ends of each statement indicate judgment of experts.

SOURCE: *Remmers, et al., 1957, pp. 48–52.*

students who attend Vassar College (Webster, 1958). Part of this research has been directed toward change in attitudes from freshman through senior year. The information has been collected by interviews with the students in college and after graduation, by testing, and by observation of the students. One of the tests developed proposes to measure such characteristics as freedom from compulsiveness, flexibility and tolerance for ambiguity, impunitive attitudes, critical attitudes toward authority (including parents or family, the state, religion, rules, etc.), mature interests, unconventionality or nonconformity, rejection of traditional feminine roles, freedom from cynicism about others, and realism. One general factor found to underly most of these separate characteristics was called "rebellious independence." Some of the items in the test which measure this factor follow, with the information in parentheses showing the percent of false responses of the Vassar women, first as freshmen and then as seniors:

> I would rather be a steady and dependable worker than a brilliant but unstable one. (F, 31–55)
>
> I have never done anything dangerous for the thrill of it. (F, 55-70)
>
> I believe in a life hereafter. (F, 39–53)
>
> A strong person will be able to make up his mind even on the most difficult questions. (F, 52–63)
>
> I don't like to work on a problem unless there is the possibility of coming out with a clear-cut and unambiguous answer. (F, 60–78)
>
> For most questions there is just one right answer, once a person is able to get all the facts. (F, 65-93)
>
> I think I am stricter about right and wrong than most people. (F, 58-70)
>
> Disobedience to the government is never justified. (F, 65–83)
>
> Communism is the most hateful thing in the world today. (F, 67–87) [Webster, 1958, pp. 112–113].

Table 9.2 shows the mean scores of various groups of females and males on the 72-item test from which the above items were drawn. Vassar is a women's college, Paine is a coeducational college for southern Negroes, and Beirut is for Arab girls. In the three colleges the mean scores go up—in the direction of greater rebellious independence—from the freshman to the senior year, with the Vassar group showing an increase from 23.567 to 34.700. Webster interpreted the data gathered in several studies as supporting these conclusions: there are substantial changes in attitudes during college; the attitudes of the students vary according to age, sex, and culture; and college students do not become more alike in their general attitudes while attending college.

Plant (1958*a*) studied ethnocentrism in freshman and senior students

TABLE 9.2. Comparison of Various Groups on the Short Form (N = 72) Developmental Scale

Sex	Classes	College	*N*	Mean Score
F	Freshmen	Vassar	321	23.567
F	Freshmen	Beirut	28	24.929
F	Freshmen	Paine	58	16.603
M	Freshmen	Paine	30	19.867
F	Sophomores	Paine	44	17.841
M	Sophomores	Paine	18	18.889
F	Juniors	Paine	28	21.571
M	Juniors	Paine	14	24.357
F	Seniors	Paine	26	19.000
M	Seniors	Paine	21	23.286
F	Seniors	Vassar	197	34.700
F	Seniors	Beirut	33	25.667

SOURCE: *Webster, 1958, p. 114.*

at a large state-supported college. In that study, similar to the one reported above, it was found that, with increasing education from the freshman to senior year, there was less acceptance of ethnocentric ideology (the tendency to exalt the superiority of the ethnic group to which one belongs). Further, males changed less than did females during the four-year college period. Plant (1958*b*) found also that at the end of the first two years of college the females were less ethnocentric than the males and that there was no difference between males and females who were members of fraternities or sororities and those who were not members. Further, intelligence was not associated with change in ethnocentrism.

The above studies indicate that changes in attitudes occur during college years and that part of the change may result from maturation and part from education. It is not known how much might be associated with the change in environment from the home to the college community, with the students' new identifications with age-mates, instructors, and the institution, and with emotional experiences. Against this background of change in ethnocentrism of college students are the conclusions of Reimann (1958) about race prejudice:

> (1) Prejudice appears during early childhood, perhaps in the pre-school years, and increases with advancing age. . . .
>
> (2) Prejudice seems to be instilled by the unconscious example or teaching of the social environment formed by parents, adults, and other children. . . .
>
> (3) Prejudice is closely tied to the basic personality of the individual. . . .
>
> (4) Prejudice is on the whole stronger than the counter-propaganda of democratic teachers and the influence of democratic ideology, and becomes more organized and more rigid as the child grows older. . . . Further, prejudice does not seem to be closely dependent on personal contact with members of minority groups, for whether we study children in the North or South, or children in segregated or unsegregated classes, the pattern of prejudice is more or less the same . . . [Reimann, 1951, pp. 88–94].

PRINCIPLES FOR FACILITATING THE LEARNING OF ATTITUDES

As shown in the preceding section, attitudes toward a variety of important life situations are acquired quite readily by children and youth of all levels of intelligence. Although many children of average and below-average intelligence cannot readily acquire certain facts, concepts, and problem-solving skills, they seem less limited in acquiring attitudes similar to those held by children and youth of above-average and high intelligence. Biological inheritance sets more definite limits upon cognitive and psychomotor learnings and skills as found in higher-level mathematics and singing or playing a musical instrument than it does upon affective learnings. In this respect, attitudes are somewhat similar to emotions in that children of all levels of intelligence (except the very lowest, perhaps) can experience relatively intense and long-lasting emotions. The importance of the environment in shaping attitudes will be clarified in the discussion of the following principles:

1. Identify the attitudes to be acquired.
2. Clarify the meanings of the attitude.
3. Extend informative experiences about the attitude.
4. Provide desirable identifying figures for the learners.
5. Provide for pleasant emotional experiences.
6. Arrange appropriate contexts for practice and confirmation.
7. Use group techniques to facilitate understanding and acceptance.
8. Encourage deliberate cultivation of desired attitudes.

Though each principle is stated with the teacher as the assumed doer or subject of each verb, the reader is not to assume that the teacher is to be highly directive and assume all responsibility for decision making about attitude learning. Rather, the teacher is to serve as a guide and organizer; and in many school situations, starting as early as kindergarten and extending through college, the learners themselves can participate in implementing the principles.

1. Identify the Attitudes to Be Acquired

If ours were a completely static society and world, this principle would perhaps be unnecessary. Our society and world are, however, rapidly changing, and much confusion arises as to which attitudes should be taught.

The rapid change in attitudes by large segments of the adult population is clearly revealed in their reactions toward Germany and Japan during World War II and shortly thereafter. With such rapid shifts in attitudes not only toward these nations but also toward others, what might be a core of attitudes to teach children in school? The list which follows is incomplete but could be used by the teachers in a school system or by a group of parents and teachers to ascertain the extent of agreement concerning which of the items should be taught in school. Though the list is organized under two headings–values and attitudes–recall that the distinction between attitudes and values is not clear-cut and that application of the terminology to children of varying school levels must be different.

VALUES

1. Good physical and mental health.
2. Pleasant home (school) life.
3. Comfortable living (school) conditions.
4. Many good friends.
5. Stimulating intellectual activity.
6. Service to society.
7. Ability to identify, recognize, and work toward the solution of significant problems.
8. Wealth.
9. Opportunity for relaxation and recreation.
10. Respect from others as a worthwhile person.
11. Acceptance of responsibility for the result of one's own actions.
12. Use of intelligence rather than force in the solution of problems.
13. Respect for the individuality of others.
14. Satisfying religious experiences.

ATTITUDES DIRECTLY CONNECTED WITH SCHOOL

(The attitudes are inferred from the behavioral statements; the student is the assumed subject of each verb.)

15. Likes the subject matter.
16. Likes the teacher or teachers.
17. Likes classmates.
18. Likes the school generally.
19. Starts work promptly.
20. Works with enthusiasm and vigor.
21. Uses spare time advantageously.
22. Follows directions.
23. Takes good care of own property.
24. Takes good care of others' and public property.
25. Works well with others.
26. Observes safety rules.
27. Practices good health habits.
28. Shows courtesy to others.

Although the values listed are generally considered more appropriate for adolescents and adults than for younger children, it is possible that, starting in kindergarten, the school can contribute toward the pupils' acquisition of these values if they are agreed upon as desirable. If a group of teachers and parents were to discuss them, questions of definition would immediately arise. What are the precise meanings of such terms as "comfortable school conditions," "pleasant school life," "wealth," and "satisfying religious experiences." After the meanings were clarified there would undoubtedly be considerable disagreement about applying the values to daily situations. For example, though people verbally subscribe to the use of intelligence rather than force in the solution of problems, the application of parents and teachers is often restated as a question: "When can intelligence rather than force be used with children in the solving of immediate daily behavior problems?"

How much agreement might be reached among a group of elementary, high school, or college teachers about the attitudes implied in Items 15-28? There appears to be considerable disagreement on Items 15, 16, 17, and 18; some teachers do not care whether or not pupils like the subject matter, the teacher, their classmates, and the school. Some teachers, because of their own attitudes or personalities, may not be able to accept Items 15-18 as desirable. If, however, agreement could be reached that the implied attitudes should be acquired by the pupils, implementing the next seven principles should prove effective in achieving them.

2. Clarify the Meanings of the Attitude

The vocabulary used in statements of attitudes or in behavioral statements which imply attitudes needs deliberate clarification for the learner, as do concepts generally. As was shown in Chapter 7, concepts should not be treated as words to be memorized. Realistic experiences with the concept as well as discussions and practice are needed before it acquires meaning. One example will point to the need for clarifying the meaning of attitudes.

The Boy Scout Oath is taken by many boys at about age eleven or twelve before they are formally accepted as Scouts; it is as follows: "On my honor I will do my best to do my duty to God and my country, and to obey the Scout Law; to help other people at all times; to keep myself physically strong, mentally awake, and morally straight (Boy Scouts of America, 1948, p. 19)." Attitudes underlying self-other relationships are also implied in the Scout Law: "A scout is trustworthy, loyal, helpful, friendly, courteous, kind, obedient, cheerful, thrifty, brave, clean, and reverent."

The Oath and Law imply many meanings, the acceptance of many attitudes, and the rejection of others not stated directly. To understand the implications of the Scout Oath so that there is a reasonable basis for acceptance or rejection, the boy, before taking the oath, should have fairly clear meanings of the following terms: *oath, on my honor, God, Scout Law, mentally awake,* and *morally straight.*

Whether the reader agrees or disagrees with oath-taking by young children and with the ideas and attitudes embodied in the Oath, the example clearly shows the need for clarifying the attitudes that supposedly guide boys' behaviors as Scouts. Some vocabulary items in the Oath are probably quite meaningless to many boys when they enter Scouting and would probably not be agreed upon by their parents. However, the Scout uniform, the medals and badges, and the activities are attractive and enticing to the boys. Their early favorable attitudes toward Scouting are based heavily on identifying with an adult leader in an attractive uniform, having pleasant emotional experiences with age-mates of the same sex, engaging in a variety of enjoyable educational and recreational activities, and receiving many verbal reinforcements and concrete rewards for saying and doing the correct thing.

3. Extend Informative Experiences About the Attitude

Accurate information about the attitude object facilitates its initial acquisition. However, if the attitude is already firmly established and the individual has openly expressed himself on it, further information may do little to modify the attitude. The means of acquiring information are manifold and include direct experiences with persons, ideas, and objects, reading books and other material, listening to radio, watching television, seeing sound movie films, and the like. The effects of different means of acquiring and giving information to influence attitudes are now considered.

Hayes and Conklin (1953) utilized three information-giving procedures with eighth-grade students to ascertain which might be most effective in changing attitudes toward and acceptance of persons of different nationality backgrounds. First, members of the various majority and minority groups enrolled in the classes were grouped together for work and play activities, with the groupings based on the eighth-graders' expressed interests in particular work and play activities. Second, factual information about various nationality groups was presented to the students in lecture-discussions and reading assignments. Third, the students as classroom groups were provided a minimum amount of factual information but were given a variety of short stories, novels, and plays to read, and besides the reading, some informal dramatizing was done. The third method achieved the best results; in the two schools in which it was used there was a greater increase in acceptance between majority and minority groups than in the schools in which the first two approaches were used.

One possible difficulty in arranging direct experiences with the attitude objects is that unpleasant emotions may be experienced and unfavorable information gathered. Having children from residential or rural areas visit the section of a city where a minority group is concentrated may result in even less favorable and more prejudiced attitudes toward that group. Similarly, taking children from large cities into a barren rural area may not result in more favorable attitudes toward life in the country.

Under various exchange programs between the United States and other countries, high school and college students are studying in foreign countries on the assumption that these exchange programs will result in better understanding and more favorable attitudes. McGuigan (1958, 1959) reported the effect of a year's study in Europe on Hollins College students. In this program each student is lodged with a French family during the school year and spends the summer session in travel throughout Europe. The students leave in the middle of their sophomore year and return in the middle of their junior year. McGuigan used a control group composed of students from the same class at Hollins who did not go to Europe. In most attitudes and personality characteristics there was little or no difference between the groups who studied abroad and those who remained at home. However, the effect of a year abroad, in comparison with the year at home, led to (1) a slight decrease in prejudice, (2) a tendency toward the development of less favorable feelings toward Americans and more favorable feelings toward Europeans, (3) more submissive social adjustment, (4) less independence, and (5) the development of higher social values.

Many investigations have been done on change in attitudes accompanying a particular course or unit. Barkley (1948) found that any one of three science courses—biology, chemistry, or anatomy—resulted in more acceptant attitudes toward evolution at all high school grade levels. Ninth-grade students who took no science course did not change their attitudes, and the ninth-graders as a group at the start of the freshman year tended toward nonacceptance of evolution. Shaw *et al.* (1952) found a marked shift in the direction of more favorable attitudes resulting from a two-week workshop for teachers and other educational workers.

Though changes in attitudes sometimes occur even after short instructional periods, new information in itself does not always direct opinions in the desired direction. Hovland, Harvey, and Sherif (1957) found that when the distance between the individual's own attitude and that presented to him was small, the individual judged the information as fair and factual; however, with increasing distance between the individual's attitude and that presented in the information, the favorable judgment was sharply reduced, and the information was perceived as propagandistic and unfair. In addition, individuals whose attitudes or whose opinions were greatly different from those advocated in the information did not change their opinions or attitudes. Hovland and Pritzker (1957), also using adult subjects, reported that information which advocated most extreme change had more effect in bringing about the change than did that which advocated moderate or a small amount of change. Further, the number of persons changing in the direction opposite to that advocated was about the same for the three degrees of advocated change—extreme, moderate, small.

In general, the rational approach to the teaching of attitudes in school is to provide the best information available about the attitude object and to encourage the learner to arrive at his own conclusions. If for any reason it is desired to encourage a particular attitude, then only favorable information is presented; basically, this is what is done in advertising. The advertiser presents the merits of his products and does not point out possible deficiencies or inadequacies. Finally, teachers and others should recognize that new or different information alone does not always alter firmly established attitudes.

4. Provide Desirable Identifying Figures for the Learners

A considerable number of our attitudes are acquired by identifying with an admired person, imitating and adopting that person's behaviors and attitudes. One of the first means by which the child of eighteen to thirty months identifies himself as a person involves sex identification. The young boy learns that he is like his father and the girl like her mother with respect to sex. Somewhere around the age of four to six years, the boy recognizes that being a boy requires that he behave more like his father than his mother. At some point during this period the boy accepts his father as the person after whom to model his behavior; the same is true of the girl and her mother. The boy imitates his father and the girl her mother in such matters as using the toilet, dressing, talking, eating, playing, and working. On starting to school the girl often identifies with a woman teacher and many boys continue to identify with their fathers, since generally there are no male teachers present in the primary grades. In the second and third grade and as the children learn to read, they often identify with characters they read about—girls with women characters and boys with men characters. A boy at this level who receives physical education instruction from a man teacher whom he admires is likely to identify with him. The most popular elementary teacher for boys is often the physical education teacher, in many cases the only male teacher.

With the child's increasing age parents become relatively less important as models to imitate. As the child grows and his social groups widen, he may pattern his behaviors on an age-mate or an older child of the same sex. Statesmen, athletes, cowboys, and adventurers often become ego ideals for boys in the upper elementary grades; these men may be in direct contact with the boy or they may exist only through his experience with reading, movies, radio, or television. Girls in the upper elementary grades often select as their ideal a famous woman of history, a nurse, or a teacher. With adolescence, girls often shift to glamorous women—the movie star, the ballet dancer, the poetess, or the religious worker—and boys tend toward correspondingly glamorous men. Both boys and girls become more realistic in later adolescence when the need to decide on a career forces them to modify their attitudes toward adult life.

There can be rejection of as well as identification with age-mates and older persons. A boy can reject his father or a teacher; a girl can reject her mother or a teacher. Persons in the more immediate environment with whom the child identifies are those who increase his satisfactions, help him overcome rough spots, and demonstrate that they like him even though they may disapprove of some of his behaviors. The adult who behaves in this manner to a child is likely to receive affection and cooperation from the child and can assume that the child will accept many of his mannerisms, attitudes, and values without much questioning.

The importance of identifying figures is well illustrated in modern advertising, especially that done by television. A principal technique is to have the hero or heroine endorse the product. Other techniques are embodied in the statements trying to associate prestige with the product: "Scientists have found . . . ," "Four out of five doctors recommend . . . ," "The thinking man . . . ." So personal is this advertising that by buying the product the user feels better, for in using the product the buyer is like whoever does the endorsing or recommending.

In at least two respects the schools have generally not been successful in providing identifying figures; teachers too frequently have not regarded themselves as possible identifying figures for pupils, and the reading materials presented to children and youth do not contain a sufficiently broad scope of possible identifying figures to appeal to the many pupils. In Chapter 4 it was shown that three main behavior patterns of teachers were associated with desirable classroom behaviors: being friendly and understanding; being responsible, businesslike, and systematic; and being stimulating and imaginative. Recall your own most admired teachers. To what extent did they display one or more of the patterns above? An adult who is friendly, understanding, and imaginative is generally admired by children and youth. Though difficult (or almost impossible for some teachers), the attempt should be made to be friendly and understanding even though the pupil may have personal characteristics, attitudes, and values that differ markedly from those held by the teacher. And it is quite certain that the pupil who rejects the teacher emotionally will also reject the attitudes and values proposed by the teacher.

Instructional materials used in the school also need careful examination. The basic textbooks and library books, including fiction and biography, are often inadequate for many pupils in that the central character, the behavior shown, and the setting are too unrealistic to serve identification purposes. In many books the hero is too magnificently successful and the circumstances are so different from usual life that many boys, especially from lower and upper social classes, cannot identify with him. Female characters are usually of two types—highly ambitious and eminently successful or excessively kind, timid, and lacking in intelligence and ambition. Many girls cannot identify with these heroines. Careful examination should be made of reading materials to ascertain the attitudes and values engendered. For example, how many stories or biographies are available of men who have become famous through achieving victory in war as compared with men who have worked industriously for peace? men who have made fortunes in business compared with men who have shown leadership in labor organizations, teaching, and the ministry? men who have achieved eminence from wealthy as compared with poor economic backgrounds? women who have achieved prominence in the theater and music as compared to teaching, stenographic work, and homemaking? A disproportionate share of children's literature depicts the lives and circumstances of only a small segment of the total population and is not representative of the family and home situations from which most children and youth come or of the occupations and successes they will achieve as adults.

The preceding discussion emphasizes that identification is more an affective than a cognitive process and that attitudes acquired through identification and imitation are not given thoughtful consideration by the acquirer. For these reasons some psychologists disagree with the principle. The same psychologists agree, however, that rejection is also more emotional than intellectual, and that rejection of a teacher or other authority figure is accompanied with nonacceptance of attitudes and behaviors. Since identifying figures are essential to normal development of children and youth, the principle is included in this section so that proper consideration is given to providing desirable identifying figures in the school.

5. Provide for Pleasant Emotional Experiences

One highly pleasant or a series of moderately pleasant experiences may lead to a long-lasting preference; one highly unpleasant or a series of moderately unpleasant experiences may lead to a long-lasting aversion. The hedonistic principle carries strong weight in attitude acquisition. If one wishes to have children develop favorable attitudes toward the teacher and the classroom, he will make the room attractive and comfortable, present a good personal appearance and dress attractively, show warmth and enthusiasm to the children, demonstrate interest in the subject matter, and make it possible for each child to experience success with some school learning tasks. If the opposite of these five things is done, it is certain that some children will develop unfavorable attitudes toward both the classroom and the school.

In those instances where unfavorable attitudes are already firmly fixed, neither pleasant emotional experiences with the attitude object nor objective information change the attitude; the individuals' self-perceptions and feelings toward self must change. Katz, Sarnoff, and McClintock (1956) found that unfavorable, firmly fixed race attitudes were more effectively modified through attempting to give insight into the self than through giving insight into the objective nature of the problem, and that individuals highest in ego defensiveness were most resistant to accepting insight into self. Carlson (1956), dealing with similar attitudes, found that persons made aware that important values could be attained by changing their attitude, tended to do so unless they were extremely prejudiced. Both studies suggest that modification and change are possible if the individual can accept a change as being more pleasant or rewarding than holding fast to the already established attitude.

6. Arrange Appropriate Contexts for Practice and Confirmation

Attitudes are not acquired simply through memorizing and talking about verbal statements. Rather, from many specific experiences, the individual integrates the meaning and feeling components into increasingly larger and more stable behavior patterns. The school that proposes to influence pupil attitudes must provide appropriate practice contexts within the classroom, the school building, and the school-community environs. If having pupils like one another is desired, what kind of practice opportunities might be arranged? First of all, the teacher, recognizing the possibility of being an identifying figure, makes certain that he manifests lively, favorable interest in the pupils. Second, as the pupils show their liking for one another, the teacher confirms or reinforces these responses with verbal statements, positive remarks about the behavior of good friends, an approving nod, a smile, or other gestures. Third, the teacher does not reject any child, nor is rejection of one or more children by the larger majority permitted. To accomplish the latter, many adjustments are needed. The child who comes to school dirty is sent to the washroom to clean up when he first arrives at school; a suitable task is found for the slow-learning child; the highly aggressive child is given opportunity to express his aggressive feelings against indestructible objects or in other ways; the withdrawing child is helped to develop some skill or interest gradually and then is incorporated into smaller groups of two or three and finally into the total classroom group.

Kindergarten and primary school teachers are generally successful in helping most children make at least one or two good friends in the classroom group; so are a smaller proportion of intermediate and upper grade teachers. High school and college teachers frequently do not accept this as a worthwhile objective and are unconcerned or are unaware that one or two children may be completely rejected by the rest of the class. Some boys and girls sit through five or six high school classes daily, knowing that among all members of the various classes there is not a single other adolescent whom they can call a friend.

Consider for further clarification one of the values listed previously in the chapter—to make a unique contribution to society. The child's society is the classroom or other school group. Each pupil is helped to identify something unique he can accomplish for the group. In the primary grades the "conversation" or "sharing" periods serve this purpose. During these periods the children report out-of-school incidents or bring objects to school, and each has opportunity to bring something of high interest to the classroom group. In the intermediate grades making a mural, decorating the room, and finding and bringing together various collections provide practice opportunities. In high school and college classes the tendency is not to engage in these sharing activities in regular class settings. Students make their unique contributions to a group in extraclass or cocurricular activities such as the school play, the annual, the athletic events, and the many clubs.

We now combine three attitudes for discussion—respect for others, respect for property, and honesty. What does practice of these attitudes mean? High school students are given opportunity and responsibility through the student council or student government to practice these attitudes. One applies the three attitudes named above by leaving lockers unlocked, the idea being that if students accept the attitudes they will not steal property from the lockers of their schoolmates. After all, if students cannot practice these attitudes in school, how can they be expected not to steal from strangers in the larger community outside the school?

7. Use Group Techniques to Facilitate Understanding and Acceptance

Classroom groups may be highly cohesive or merely a collection of individuals. In a cohesive group, the members tend to conform to the attitudes and goals that hold the group together. This does not mean, however, that individuals within a cohesive classroom group may not hold rather diverse attitudes about matters not directly concerned with the group. The same is true in a closely knit family. The family may be cohesive and yet encourage individuality among its members. Several techniques are useful in helping members of a group to understand and accept common attitudes. Three which deserve special consideration are role playing, sound films and discussions, and group decision-making.

Role Playing. Role playing in various forms, including sociodrama and psychodrama, is unrehearsed dramatization dealing with a social or psychological problem. In most role-playing situations students use only the information they already have, but in some instances information is provided to the students. There is no rehearsing, no memorizing of lines, and no coaching as in ordinary dramatic presentations. Role playing in classroom settings is generally based on informal class discussions dealing with a wide variety of topics. The students informally dramatize such behavioral characteristics as shyness, aggressiveness, good manners, prejudice, courtesy, and dishonesty. Also, they can carry out roles drawn from novels, short stories, newspaper stories, plays, and the like which the class has studied.

Culbertson (1957) had college students engage in fifteen minutes of role playing. Each role player was instructed to advocate in the community an educational program completely in favor of integrating Negroes into the community in connection with defense work. A pretest was administered to the students about two weeks before and again seven to ten days after the role playing. The pre- and posttest scores indicated a decided shift in attitudes in the direction of the role playing; that is, the students who played the roles became more favorable toward having Negroes move into a white neighborhood and also became more favorably inclined generally toward Negroes. A control group of students who did not see the role playing did not change attitudes; students who observed but did not participate in the role playing did not shift their attitudes to the extent that the participants did. In this experiment, as in role playing generally, the participants expressed their feelings as they portrayed a role and presented information. Role playing thus combines informational and emotional experiences related to the underlying attitudes.

Stanley and Klausmeier (1957) set up a role-playing situation slightly different from Culbertson's and obtained somewhat different results. Their subjects were also college students, the role playing lasted fifteen minutes, one control group was completely unaware of the role playing, and another control group were observers of the role-playing situation. In this experiment all students were first given a test to sample their opinions about international organizations, and on the basis of this test the students with extreme attitudes—favorable and unfavorable—were identified. After identifying the students with extreme attitudes and assigning them to one of the three groups, the researchers arranged the role-playing situations so that each role player played a role directly opposite to his attitude as expressed on the test. The role playing had no effect upon the attitudes as measured by a test two days after the role playing was completed. By the design of the experiment it was impossible to ascertain what might have resulted had the students been chosen to play roles in harmony with their originally expressed attitudes. Culbertson also did not test this possibility, having omitted as role players those students who on the pretest indicated favorable attitudes toward integrated housing. One other difference between the two studies was that Culbertson's role-playing situation was more realistic (an actual community problem served as the theme) and informally conducted; there may, therefore, have been more ego involvement in Culbertson's subjects.

Janis and King (1954) gave their role players a prepared outline of information to use in the role-playing situation. The control group received the same written information and listened to the role playing. In this experiment the role players changed opinions in the direction of the role played more than did the control group. The role players whose attitudes changed markedly displayed considerable improvisation of the supplied information in their presentations and appeared well satisfied with their oral presentations. Janis and King suggested that changes resulting from role playing may come about because the role player is impressed by his own arguments, illustrations, and the convincing appeals that he uses to stimulate others; or the role player interprets his performance as a rewarding experience that gives him emotional satisfaction. The latter factor was felt to be important in the change because the students who indicated immediately after role playing that their performance had been satisfactory were subsequently found to have changed their opinions considerably.

The effect of role playing on children and youth of school age is not clearly established. It is hypothesized, however, that role playing would probably be more powerful in helping individuals to acquire new attitudes than in changing attitudes already firmly fixed, and that it might be more effective with school-age children than with adults. Some cautions in the use of role playing are also necessary. One should not put a student in a role-playing situation in which he would feel highly uncomfortable. For example, it would be most unfortunate to have a shy, withdrawing child try to play the role of a shy, withdrawing child or of a boisterous, aggressive child before his classmates. The favored procedure for a teacher who might not know the children well is to discuss with the whole class the role-playing situation, including the various characters or roles, and then to ask for volunteers.

Sound Films and Group Discussion. The sound motion picture, live televison, and kinescope offer considerable possibility for influencing attitudes in that information can be presented visually and orally, identifying figures can be shown, and a pleasant emotion can be experienced by the observer. As May (1946) pointed out, learning skills from observing film presentations involves delayed imitation; therefore discussion both before and after the film presentation is needed in order to profit most from it. Direct practice of the skill, rather than simply observing, is also needed. More recent experimentation, using films and discussions, has shown some prospect for influencing attitudes.

Mitnick and McGinnies (1958) carried out an exciting experiment with 400 high school students. Students who scored high, middle, and low in ethnocentrism were identified. These were then assigned randomly to one of three groups. One group saw a film unfavorable to ethnocentrism but did not discuss it; another group saw and discussed the film; the control group neither saw nor discussed the film. Among several important findings from the investigation were these: First, a significant reduction in ethnocentric attitudes occurred in the group who had seen the film only and in the group who had seen the film and followed the viewing with discussion; however, those students who did not actively take part in the discussion after seeing the film did not change attitudes. Second, the stability of the attitude change after an elapsed time of one month was higher for the discussion groups than for the film-alone group; the film-alone students had regressed significantly toward their original attitudes. Third, the amount of information learned from the film and discussion was related to the degree of ethnocentrism held by the individual—the higher the degree of ethnocentrism, the less he learned. Fourth, active participants in the film-plus-discussion group learned more from the film than did students who were passive during the discussion. Fifth, no significant relationship was found between intelligence and attitude.

Discussion without films is also useful for presenting and clarifying information. In small-group or whole-class discussions, pupils have the opportunity to try out their ideas with one another and with the teacher. In this trying out certain of their expressions and behaviors are reinforced; others are not. Beyond this, classroom discussions can serve the very useful purpose of helping learners evaluate propaganda. It is known that many agencies and groups are using television presentations, often filmed or recorded, to influence people's attitudes on controversial issues. By definition, there are at least two sides or points of view on a controversial issue. One can easily be misled by being acquainted with and accepting only one point of view. Whether it be an educational or a commercial film or television presentation, students at the time of graduation from high school or earlier should be competent in checking whether facts representing both sides of a controversial issue have been presented.

Group Decision-Making. There is a vast difference between being presented information by someone about appropriate and inappropriate conduct and arriving at a decision in a group as to what is appropriate or inappropriate. When an individual shares in making a decision he abides by that decision to a greater extent than if he does not share in it.

Lewin (1958) brought together many of his significant ideas and research about group decision-making and social change shortly before his death. He pointed out that group decision-making is different from both individual decision-making and the mass appeals characteristic of radio and newspaper propaganda. In group decision-making the individuals are members of face-to-face groups and do not feel separated from others as they do when they listen to a lecture or read a book or view a television production. Some of the representative effects of decision-making in groups compared with other means are now given.

In an attempt to get housewives to use meats that they were not using—beef hearts, sweetbreads, and kidneys—researchers presented information in attractively arranged lectures to a group; another group, led by a trained leader, discussed the possibility of using these meats until a decision was reached. A subsequent check showed that only 3 percent of those who listened to the lecture were using the recommended meats, but 32 percent of those who shared in the group decision were. In another experiment some groups of housewives were presented lectures for the purpose of increasing their home consumption of milk, whereas other groups were led in discussion and arrived at a group decision. The same information about milk consumption was presented to both the lecture and decision-making groups. In this experiment, about 45 percent of those who had shared in decision-making and about 15 percent of those who heard the lectures were using more whole milk two and four weeks later. In a third experiment completely individualized instruction about the importance of cod liver oil and orange juice in the baby's diet was given to a group of mothers preparing to leave the hospital. Other mothers participated in group discussions, leading to decisions about using the juice and oil. The individualized instruction was managed well; however, after two and four weeks the mothers who participated in the group decision were carrying out the practices recommended by the hospital nutritionist to a greater extent than those who received individualized instruction.

All of the groups in the experiments reported by Lewin were relatively small, usually from six to seventeen persons. This small number of members permitted relatively free discussion. It is possible that the give and take in the discussions, the reinforcing and negating of expressions by the members, along with the informational content and emotional commitment involved in the decision-making contributed to the change in behaviors and the underlying attitudes on which the changed behaviors were based. If somehow in the school, circumstances could be arranged whereby the large majority of the student body, organized into small groups, agreed to keep the corridors relatively clean and quiet, to get to class on time, to start work promptly when getting to class, to respect the ideas and property of others, and many other behaviors implied in the attitudes listed earlier in this chapter, there would be little need for much of the policing and rule-making now present in many schools. Along with this decision-making by the students, the teachers would arrange the kind of learning opportunities whereby pupils felt they could learn something of value each day.

8. Encourage Deliberate Cultivation of Desired Attitudes

As stated previously, each individual eventually has to integrate his own attitudinal system from the many experiences he has. At some point the individual might decide that he would get along better with himself and others if he could acquire a friendly attitude toward his associates. How can this be done? The process of acquiring a new attitude is much the same as acquiring any new habitual way of behaving, for example, of brushing one's teeth each morning, or writing more legibly, or spelling more correctly. One begins with a purpose and practices. Careful consideration of the importance of the attitude in one's life, strong determination to carry out the behavior implied by the attitude, allowing no exception in the behavior, and taking every opportunity to act upon the new attitude leads to stability and eventual incorporation into one's total behavior pattern without conscious effort.

It is easier to read the above words than to carry out what they imply. A deeply ingrained habit, such as cigarette smoking or writing rapidly and illegibly, is not easily broken. A firmly established attitude, such as a prejudice in the area of religion, race, or politics, is perhaps equally difficult to change deliberately. Thus, the above suggestions are more applicable to the acquisition and establishment of a new attitude than to extinction of one already firmly established. And this has serious implications for teachers and teaching. If for any reason a prospective teacher cannot acquire a liking for the subject matter, for teaching duties generally, or for living in a classroom with pupils and cannot deliberately change his own attitudes, he should perhaps not enter teaching.

DEALING WITH EXTREME ATTITUDES

For no apparent reason a child may have an aversion to some object in the room, e.g., chalk or paste. Another child may have deeply engrained prejudices against those of a different race, religion, or nationality background, including the teacher. Many youth attending high school have been apprehended for delinquent behavior and regularly report to a parole officer or social worker. Some groups in the United States hold extremely destructive attitudes toward other groups, and no one as yet has devised adequate means of dealing with the situation. To change some attitudes and values means a change in personality of which many individuals are not capable. Conformity or agreement upon all attitudes and values is, of course, not the goal. However, there must be a sufficiently large core of common attitudes and values for people to live together reasonably well. A balance somehow must be found between encouraging uniqueness in individuals and requiring conformity to reasonable group standards and to the codified laws of the land.

To help antisocial youth, prejudiced children, and others with extreme attitudes, the teacher does the best his knowledge and own personality permit. He attempts to be a respected person, an understanding teacher, and carries out principles as proposed above. If this effort fails, the teacher then tries to get additional help. School psychologists, counselors, and social workers are available in some school systems to help the teacher. In many communities a variety of public and private agencies are operating to assist the school and the home.

SUMMARY

The main difference between an attitude and a concept is that the former directly influences the individual's acceptance or rejection of attitude objects

—ideas, persons, things, situations. Attitudes, to a greater extent than concepts and psychomotor abilities, are acquired through conditioning and identification. Membership in primary groups, such as the family and informal neighborhood and school groups, markedly influences attitude development.

Some attitudes are acquired early and become more firmly established with increasing experience; others are modified. Attitude acquisition and modification have been demonstrated at all school levels, but more so in children than in adolescents and adults. Whether a favorable, neutral, or unfavorable attitude is learned depends upon how the individual feels about the object. Pleasant feelings, success, and rewards produce favorable attitudes; unpleasant feelings, failure, and punishments lead to unfavorable attitudes.

When agreement is reached on the attitudes to be learned in school and when adults adhere to them, acquisition of those attitudes by children and youth is facilitated through (1) clarifying the meanings of the attitude, (2) extending informative experiences about the attitude, (3) providing desirable identifying figures for the learners, (4) providing for pleasant emotional experiences, (5) arranging appropriate contexts for practice and confirmation, (6) using group techniques to facilitate understanding and acceptance, and (7) encouraging deliberate cultivation of desired attitudes.

QUESTIONS AND ACTIVITIES

1. (a) Discuss the differences among tastes or preferences, attitudes, and values.
   (b) Give three examples of each applied to yourself at present.
2. (a) Discuss the affective, informational, and group bases of attitudes, applying the discussion to attitudes or values which you hold.
3. (a) Identify and discuss two or three conclusions about attitude formation and modification during elementary school years;
   (b) during high school years;
   (c) during college years.
   (d) Why are attitudes less stable than concepts or psychomotor skills?
4. (a) Study and define the fourteen statements of values on page 268 to clarify the meanings. Then arrange them in order, from highest to lowest, on the basis of their importance in your life.
   (b) Arrange them from highest to lowest on the basis of their importance to adults generally.
5. Classify statements 15–28, with A to mean the school should encourage the behavior in all students, B to mean the school should encourage the behavior in the majority of students, and C to mean the school should encourage the behavior in a minority of the students.
6. Rank the last seven principles for facilitating attitude development in the order in which you are most able to carry them out as a teacher.
7. (a) Discuss the extent to which education should clarify meanings of and provide informative experiences about attitudes rather than indoctrinate.
   (b) When does factual information not prove useful in modifying attitudes?

8. Discuss the means and extent to which identification is important in acquiring attitudes, relating the discussion to:
   (a) your own attitudes;
   (b) attitude learning in school.
9. Why are pleasant emotional experiences especially important in the modification of attitudes?
10. Compare the effects on students of listening to and discussing statements of attitudes with discussing the statements and practicing what they imply for behavior.
11. (a) Indicate possible uses of each of the following in school situations:
      (a) role playing;
      (b) sound films and group discussion;
      (c) group decision-making.
    (b) Under what conditions might each of the above produce attitudes opposite to those which the teacher desires the students to acquire.
12. Discuss the possibilities of deliberate cultivation of an attitude. Attempt to identify and deliberately cultivate an attitude.

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Chapter 10 Affective Outcomes II: Personality Integration and Character

Chapter 9 discussed how a person's attitudes markedly influence his acceptance and rejection of attitude objects—things, persons, and ideas. In this chapter other learning outcomes with heavy affective components are discussed. The main emphasis is upon the positive role of the teacher and the school in helping pupils acquire reasonably adequate personality integration, of which one aspect is character. Little attention is given to the remedial role of the teacher and school, as can be inferred from the main topics: (1) the relationship between personality integration and character; (2) the bases of personality integration; (3) principles for encouraging personality integration.

THE RELATIONSHIP BETWEEN PERSONALITY INTEGRATION AND CHARACTER

Though persons talk freely about personality, those who have studied it systematically find it difficult to describe and do not completely agree as to what is being described as personality. According to Allport: "Personality is the dynamic organization within the individual of those psychophysical systems that determine his unique adjustment to his environment" (Allport, 1937, p. 48). This definition implies that personality is changeable or dynamic, yet sufficiently stable and well organized that it can be studied and described. It also suggests that an individual's personality includes his motivational and value systems, his beliefs, desires, and the like. According to Hall and Lindzey, there are so many different conceptions of personality that ". . . personality is defined by the particular empirical concepts which are a part of the theory of personality employed by the observer" (Hall and Lindzey, 1957, p. 9). In this chapter, the definition of Allport is accepted, with the implied assumption that one's personality affects his responses to others and elicits responses from others. As implied in the chapter title, the emphasis is upon integration for the purpose of making adequate adjustments to the total perceived environment, including self.

Though personality integration includes internalization of ethical values, in practice a distinction is frequently made between personality integration and character, with character used to denote ethical attitudes, values, and motives. Character is thus evaluated on such bases as the extent to which an individual conforms to ethical values and laws set up by society and in relation to his motives in situations where ethical values are involved. A pupil's character may be evaluated as good if he conforms to the ethical standards of the teacher and the rules of school, and if his motives for subsequent behaviors are judged ethical.

To separate character development from personality integration in day-to-day behavior is somewhat evasive and impractical. The effects of attempting to get children and youth to conform to reasonable standards and to acquire ethical motives should be related to personality organization of the individual. Encouraging sufficient pupil conformity to permit a good learning environment is an entirely acceptable objective of the teacher and the school, as is the teaching of ethical values. Achievement of these objectives, however, should not be considered in isolation but as an important component of the broader objective of personality integration.

Shoben (1957), discussing normal personality as a reality, pointed out that the role of the school and such agencies as the family and the church is to facilitate positive growth in children and youth, including the skills, knowledge, and attitudes which permit more productive, contributory, and satisfying ways of life. Ethics are of high concern to these agencies and they must be concerned with such issues as happiness and right conduct. Proceeding from this acceptance of the importance of values, and a careful analysis of the psychological literature dealing with personality, Shoben proposed a model of integrative adjustment and summarized it thus:

> This model of integrative adjustment as characterized by self-control, personal responsibility, social responsibility, democratic social interest, and ideals must be regarded only in the most tentative fashion. Nevertheless, it does seem to take into account some realistic considerations. It avoids the impossible conception of the normal person as one who is always happy, free from conflict, and without problems. Rather, it suggests that he may often fall short of his ideals; and because of ignorance, the limitations under which an individual lives in a complex world, or the strength of immediate pressures, he may sometimes behave in ways that prove to be short-sighted or self-defeating. Consequently, he knows something of the experience of guilt at times, and because he tries to be fully aware of the risks he takes, he can hardly be entirely free from fear and worry. On the other hand, a person who is congruent to the model is likely to be one who enjoys a relatively consistent and high degree of self-respect and who elicits a predominantly positive and warm reaction from others. Moreover, it is such a person who seems to learn wisdom rather than hostile bitterness or pathologically frightened withdrawal from whatever disappointments or suffering may be his lot . . . [Shoben, 1957, pp. 188–189].

Notice that in evaluating adjustment one must make judgments about "self-control," "personal responsibility," "social responsibility," "democratic social interest," and "ideals." And as Shoben pointed out, this means that one would not conclude that the thief, the murderer, and the delinquent are well-adjusted personalities, however well they may satisfy their own needs or however rational their behavior may appear to themselves. Ethical values, including what is generally considered character, cannot be reasonably treated as separate from personality integration or, in Shoben's terms, "integrative adjustment."

This point of view implies that character education should not be treated as the memorization of a list of rules, commandments, or principles unrelated to the ongoing activities of the classroom and the school. Further, children cannot be well adjusted if the ideals, rules, and regulations they accept as ethical guides for behavior cannot be practiced in daily life situations because of their unrelatedness or direct contradictions in meeting the demands of such immediate situations. And though some stable values for ethical conduct are generally accepted, the individual should not blindly accept these without questioning their application to him or to the social groups of which he is a part.

THE BASES OF PERSONALITY INTEGRATION

What is judged to be normal personality development varies markedly from one culture to another, and somewhat among subgroups within the same culture. In the United States, for example, denominational religious groups, ethnic groups, and occupational groups do not completely agree as to what constitutes a healthy personality. Varying conceptions of the nature of man also lead to differences in how adults interpret desirable personality development to children and youth in the home, school, and church. In part these differences among adults are reflected in three main types of schools: public, private, and parochial.

Chronological age within broad developmental levels must also be taken into account when considering personality integration. We expect to find differences between such broad age groups as preschool, elementary, high school, and college. Here too, conceptions of appropriate behaviors for various broad developmental levels are not in complete agreement. Anderson (1948) summarized two conflicting points of view about personality organization in young children:

> (a) Infants and young children are essentially passive recipients of stimulation who display little energy or activity on their own; (b) are very delicate and tender, and have little capacity to resist or survive and are especially sensitive to lack of affection to which they cannot adapt for even short periods; (c) are unusually susceptible to, and carry the effects of, traumatic episodes indefinitely; (d) carry forward all their memories and experiences, which later come out to plague them; (e) in their behavior and the products resulting, are subject to all the implications and values that inhere in adult reactions in similar situations.
>
> In contrast to these views of child nature, scientific findings which lead to a more accurate picture may be considered. These can be grouped under several heads: the child as an energy system with high capacity to resist deformation, stress,

TABLE 10.1. Dimensional Comparison of Theories of Personality

	Purpose	Unconscious Determinants	Reward	Contiguity	Learning Process	Personality Structure	Heredity	Early Developmental Experience	Continuity of Development	Organismic Emphasis	Field Emphasis	Uniqueness	Psychological Environment	Self Concept	Group Membership Determinants	Interdisciplinary Emphasis		Multiplicity of Motives
																Biology	Social Science	
Freud	H	H	H	M	L	H	H	H	H	M	L	M	H	M	L	H	M	L
Jung	H	H	M	L	L	H	H	M	L	H	L	M	M	M	L	H	L	M
Adler	H	M	L	L	L	M	H	H	H	M	H	H	M	H	H	M	H	L
Horney	H	H	M	L	M	M	L	M	M	M	M	M	M	H	H	L	H	L
Fromm	H	M	M	L	M	M	M	M	M	M	M	M	M	M	H	L	H	L
Sullivan	H	M	M	H	M	M	M	M	H	H	H	M	H	H	H	M	H	M
Lewin	H	L	M	L	M	M	L	L	L	L	H	H	H	M	H	L	M	H
Allport	H	L	L	M	M	H	M	L	L	H	L	H	M	H	L	H	L	H
Murray	H	H	M	L	L	H	M	H	H	H	H	M	H	M	M	H	H	H
Sheldon	L	M	L	L	L	H	H	L	H	H	L	H	L	L	L	H	L	L
Eysenck	L	L	M	L	L	H	H	L	M	L	L	L	L	L	L	M	L	L
Cattell	M	M	H	M	H	H	H	M	M	L	L	M	L	H	M	H	L	H
Miller & Dollard	L	M	H	M	H	L	L	H	H	L	L	L	L	L	M	M	H	M
Angyal	H	M	L	L	M	H	M	L	H	H	M	L	H	H	L	M	L	L
Goldstein	H	L	L	L	M	L	M	L	L	H	M	L	H	H	L	H	L	L
Rogers	H	M	L	L	M	L	L	L	M	H	M	M	H	H	M	L	L	L
Murphy	H	M	H	H	H	H	H	H	H	H	H	M	M	M	H	H	H	H

Key: H high (emphasized); M moderate; L low (de-emphasized).

SOURCE: *Reprinted with permission from C. S. Hall and G. Lindzey,* Theories of Personality, *1957, p. 548, John Wiley & Sons, Inc.*

and trauma; and the child as a mechanism that meets life not as a storehouse or filing cabinet, but as an active system engaged in transforming input into outgo [Anderson, 1948, p. 410].

Anderson suggested that the first ideas were largely theoretical but that those in the last paragraph were established. Differences among the major theorists about personality, as well as others who write about that subject, are quite large.

Hall and Lindzey (1957) made an analysis of seventeen major personality theories. Table 10.1 summarizes the analysis. The issues or determinants of personality are listed at the top and the theorists in the left column. As the key to Table 10.1 indicates, the symbol "H" indicates that the theory emphasizes the importance of the issue or set of determinants, "M" indicates that the theory occupies the middle ground, and "L" suggests that the issue or position is deemphasized within the particular theory. It is interesting to note that at least one theorist emphasizes, one assigns moderate importance to, and one deemphasizes each of the eighteen issues or determinants of personality. The following are illustrative of the high, moderate, and low emphasis given to various issues or determinants: (1) Heredity receives high emphasis in seven theories, moderate emphasis in six, and low emphasis in four. (2) Early developmental experiences in the forming of personality receive high emphasis in five theories, moderate emphasis in five, and low in seven. (3) The continuity of personality development is given high emphasis in eight, moderate emphasis in five, and low in four. (4) The uniqueness of personality is given high emphasis in four, moderate in nine, and low in four. (5) The psychological environment in the forming of personality is given high emphasis in seven, moderate emphasis in six, and low in four. (6) The self concept is given high emphasis in eight, moderate emphasis in six, and low in three. (7) Group membership determinants of personality is given high emphasis in six theories, moderate emphasis in four, and low in seven. Two theorists, Sullivan and Murphy, give high or moderate emphasis to all of the issues and determinants listed in Table 10.1.

In discussion of the bases of personality integration in this chapter, the emphasis is upon learning. The main bases of personality integration are: (1) health and psychomotor skills; (2) satisfying emotional life; (3) knowledge and related intellectual skills; (4) adequate means of psychological adjustment; (5) integration of personal needs and social demands; (6) an adequate self concept.

Health and Psychomotor Skills

Chronic poor health or a physical handicap may color unfavorably the individual's entire perceptions of himself and the world about him and may prevent him from acquiring adequate means of adjustment. It may interfere with or at least limit his acquisition or use of motor and intellectual abilities. Not everyone with a chronic illness is maladjusted, of course. Some people with severe handicaps such as blindness or deafness, being crippled, or being shut in for long periods of time have made excellent adjustments. These people have themselves found or have been helped to find adequate means of adjusting, despite their handicap or illness. In general, however, the school and the home justifiably attempt to promote good physical health in children and give considerable attention to such matters as adequate nutrition, adequate facilities for rest and relaxation, protection from disease and physical injuries, and correction of a variety of illnesses and other physical conditions subject to improvement through medication and exercise.

In Chapter 8 psychomotor skills were discussed at some length; therefore only a few examples of application of those skills to personality development are now given. Being extremely deficient in one or more of the psychomotor skills that are common to other children of about the same age may constitute a serious block toward personality integration. Not being able to perform prestige-giving physical skills may lead the child to perceive himself in an unfavorable way with subsequent withdrawal or aggressive behavior. Similarly, it may prevent his experiencing the usual give-and-take social relationships in play and recreational activities that other children normally enjoy. As the handicapped child with a finger or arm amputated can learn to adjust to a variety of home, school, and other situations, so also the child who is much less proficient than other children in such tasks as writing, singing, and engaging in physical activities can adjust; but to do so he needs much help from the teacher.

Unfortunately, much of the physical education in junior and senior high schools is directed toward helping those who are already superior, and in all types of competitive classroom situations low proficiency in any skill—handwriting, music, art—often results in being ignored or unfavorably handicapped. High proficiency in physical skills also can be a handicap as well as an asset to personality integration. The individual highly superior in the performance of many psychomotor tasks can react and be reacted to in a positive, neutral, or negative direction.

Heredity as well as environmental factors are determinants of health and proficiency in psychomotor tasks. In most cases we cannot ascertain what a child has obtained through heredity until after we have provided many opportunities for him to grow and to learn. Since the school, like the home, can do nothing to change the child's inheritance, the better procedure is to help youngsters maintain and capitalize upon whatever they have inherited. And it is quite certain that an enriched environment leads to better results for all children than does a deprived or impoverished one.

Satisfying Emotional Life

The importance of emotional experiences in connection with attitude acquisition and modification by individuals was shown in the previous chapter. In the broader society, too, it is apparent that many behaviors are governed by emotions. World leaders deliberating about peace and war in the United Nations or a family or school group discussing a television program bring emotion as well as information to their debate. Frank (1954) summarized the importance of emotions to the individual and society thus:

> It is evident that for full-functioning, adult living, the capacity for emotional response is essential. We cannot destroy or completely suppress normal functional processes without stunting and distorting the personality and creating individuals who, because they lack capacity for emotions or are so very rigidly and unchangingly fixated, may be as menacing and destructive as the individuals who are completely impulsive and unable to regulate their emotional reactions. . . .
>
> Emotional integrity, as a goal for adult living, requires flexible, nonrigid personalities capable of reacting emotionally, of experiencing anxiety, guilt, and hostility, when these are appropriate and legitimate responses to life experiences. An adult cannot live as a whole person, as an integrated organism-personality, capable of meeting life tasks and maintaining productive interpersonal relations unless he can react emotionally and have feelings when these are normal, wholesome reactions. But emotional integrity has to be achieved through progressive but gradual maturation of the personality from infancy onward. . . .
>
> If we ask how we can foster emotional maturity and guard the emotional integrity of the developing child and adolescent, we cannot offer any very clear and sure answers. There are, however, some promising leads we should recognize and a few beginnings of improved procedures. Basically, the problem is to provide the child with materials, situations, practices, and relationships in which he can react emotionally when provoked, but release or express those reactions in ways that are not self-defeating (bottling up, repressing, etc.) nor socially destructive (complete permissiveness). This means providing at each stage of his development what will be adequate equivalents for earlier expressions or releases. They may be symbolic surrogates or substitutes through which an emotional reaction may be released, channeled, transformed. . . .
>
> In our educational processes in the family, in schools, increasingly in nursery schools and kindergartens, in our high schools of varied kinds, in our colleges, in our many agencies for children and youth, in organizations for recreation and leisure time, in summer camps and work camps—everywhere there are possibilities for helping to develop wholesome personalities who from early infancy have courage, confidence in themselves, trust in people, and faith in our enduring goal values. Giving the emerging personalities of children and adolescents much-needed help to mature emotionally and to maintain their emotional integrity as organism-personalities offers the most promising and rewarding ways of developing a better social order and orienting our children as future members of a world community. . .[1]

We now turn to three dimensions of emotion: pleasantness–unpleasantness, organization–disorganization, and motivation–response.

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[1] From *Feelings and Emotions*, by Lawrence K. Frank, pp. 28, 32, 34, 38. Copyright 1954 by Random House, Inc. Reprinted by permission.

PLEASANTNESS–UNPLEASANTNESS. Emotions such as excitement, delight, elation, affection, and joy are generally considered pleasant. Adults in the home and school often make a deliberate attempt to manage situations so that children and youth experience these pleasant emotions. Children by the age of twenty-four months have already experienced all the pleasant emotions listed above, as well as the unpleasant ones of distress, anger, disgust, and fear (Bridges, 1932, p. 340).

Unpleasant emotions are designated by such terms as anger, disgust, fear, jealousy, guilt, worry, and the like. Whereas the pleasant emotions are considered essential to well-being, the unpleasant are considered less useful and, in many situations, harmful. However, many persons, including Frank, as noted previously, suggest that some experiencing of unpleasant emotions is unavoidable and that their effect on personality organization depends in part on how they are expressed and on their duration and intensity. Both pleasant and unpleasant emotions can be of long or short duration and of high or low intensity. These factors are closely associated with the organization–disorganization dimension.

ORGANIZATION–DISORGANIZATION. The physiological processes set in motion as an intense emotion is experienced are controlled by parts of the nervous system which are not under the domination of the cortex, the center of consciousness. After an intense emotion, pleasant or unpleasant, considerable time elapses before the heart beat slows, the respiratory rate decreases, and the flow of saliva and gastric juices returns to normal. In order to survive, primitive man needed to meet dangerous situations with increased ability to run, hit, strike, see, hear, and smell; during a state of intense emotion ability does increase in all these areas. Modern man, too, sometimes finds these physiological changes helpful in emergency situations, as when he is able to rescue people from burning buildings by unusual strength exerted under intense emotion. Thus, when increased strength and sensory acuity are required, intense emotion enables the individual to organize his best abilities to take care of immediate situations. There is, however, a decrease in ability to think clearly about all of the factors in the emotion-producing situation. If increased rational behavior rather than increased physical abilities is necessary to meet an emergency and if the physical energy is repressed or not used, the over-all effect of strong emotion is disorganization. Children, as well as adults, experience intense anger and fear but cannot follow through with appropriate physical acts. We cannot strike, kill, or run away when angry or afraid. When we control such unacceptable physical expressions (but not the emotion) without finding adequate but more acceptable substitutes, our behavior becomes disorganized. Intense erotic love also, which may be regarded as pleasant or unpleasant, is needed for survival of the race and its physiological components and effects are much the same as those for intense anger or fear.

Pleasant emotions do not have the disorganizing aspect that intense or long-lasting unpleasant emotions have. On the contrary, such emotions as affection, joy, and delight enable the individual to organize his total cognitive and psychomotor abilities to meet situations more effectively. Less-intense anger and fear likewise appear to have an organizing affect in that the person mildly angry tends, while focusing upon the object of his anger, to organize his total body responses more effectively to meet the situation.

MOTIVATION–RESPONSE. In the above discussion emotion has been treated mainly as a response. Effort is also deliberately made to experience affection, excitement, and joy. Further, the individual tries to avoid situations wherein he might experience unpleasant emotions. In this manner emotions serve as motivating forces in the daily affairs of human beings, including children and youth in the classroom.

Leeper (1948) suggested that emotions have been mistakenly treated and defined as disorganizing responses but that it would be more fruitful to consider emotional processes of all sorts, except in highly intense form, as organizing influences to be studied as one aspect of motivation. An important implication of this view for classroom instruction is that emotional behavior, including the expression of fear, anger, jealousy, and guilt, should not be condemned as irrational and harmful. The better procedure is to arrange the environment so that children and youth experience pleasant emotions, learn how to handle themselves in unpleasant situations in which they experience intense and unpleasant emotions, and utilize their capacities for emotional experiences to the fullest as they are encouraged to utilize their psychomotor and cognitive abilities.

Knowledge and Related Intellectual Skills

As health and psychomotor skills affect personality integration, so do intelligence and cognitive abilities. Children and youth of low intelligence and academic achievements are often less well accepted in the classroom than are those of low psychomotor abilities. Parents also seem to accept small stature, physical handicaps, and low motor performances in children more readily than lower intellectual abilities. In turn, because of unfavorable reactions from others and lower ability to deal with symbolic learnings and frustrating situations, the child considerably lower than his age-mates in intellectual abilities may experience relatively severe adjustment problems. He has difficulty in accepting himself, especially if he feels that his teacher and classmates do not.

The learning of facts, concepts, problem-solving skills, and means of creative expression as incorporated in the usual school subject matter was considered in Chapters 6 and 7. In connection with adequate personality integration, children and youth need considerable knowledge about themselves; about managing their relationships with others; about emotions, ethical values, and intercultural relations. However these topics are usually not incorporated in the school's more formally organized courses or in instructional materials. Though formal study of psychological topics is probably not needed in the elementary grades or high school, deliberate rather than incidental effort to incorporate this type of material into English, social studies, science, and other instructional fields should prove helpful. In any properly guided class, of course, reading about, discussing, and dramatizing pleasant and unpleasant emotions, ethical values, and intercultural attitudes can result in better understanding.

Adequate Means of Psychological Adjustment

In a broad sense all learning is adjusting in that through learning one acquires knowledge, skills, and attitudes to meet various situations with increased efficiency and satisfaction. Learning adequate means of psychological adjustment refers more specifically to intrapersonal and interpersonal relationships, especially in frustrating situations. The appropriateness of the means is determined by raising and answering questions such as the following: (a) Do they lead to survival of the individual? (2) Do they lead to a satisfying life in the groups of which the individual is a member? (3) Will the present means of adjustment promote later successful adjustment? (4) Do the means of adjustment conform to generally accepted ethical principles? As applied to school situations we might evaluate a child's means of adjustment as being satisfactory or good (1) if they lead to good health and avoidance of injury, (2) if they lead to satisfying relationships for the individual and the members of the groups to which he belongs, (3) if the present means lead to later successful adjustment, (4) if they do not transgress codified laws, and (5) if they conform to unwritten but generally accepted ethical principles as embodied in the value system of the school and the teachers. These questions imply that psychological adjustment is not simply accepting the status quo or conforming to present conditions and group demands without attempting to improve oneself or to change circumstances, including the social groups in which one lives.

It is inevitable that individuals experience frustrating situations and that their adjustments do not meet all five criteria above. Often, a person must choose between two desired goals or between two unpleasant tasks—a frustrating circumstance. But more often frustration is experienced when a desired goal cannot be immediately achieved. Some condition within himself, his physical environment, or his social environment prevents the individual from reaching the goal. When the block cannot be overcome with persistent effort, tension increases, especially if the goal is highly desired.

A high school boy, for example, may strongly desire approval from his classmates; but his classmates do not accept him, much less give him recognition and approval. This boy, then, becomes frustrated. A variety of possible adjustments to frustrating situations of this type might be made. The principal adjustments are: (1) goal-oriented effort; (2) reinterpretation of self-situation relationships; (3) pursuit of a substitute goal; (4) withdrawal; (5) aggression and related reactions; (6) suppression and related reactions; (7) anxiety and related reactions.

Though the above are commonly observed among individuals and sometimes within the same individual, not all are equally effective means of adjustment. Goal-oriented effort, reinterpretation of self-situation relationship, and pursuit of an appropriate substitute goal generally lead to better future adjustments than do withdrawal, aggression, suppression, and anxiety. However, in some situations the last four are the only means that the individual perceives as being appropriate to maintain his physical existence or his self-esteem.

GOAL-ORIENTED EFFORT. A high school student who lacks skills in dancing, swimming, public speaking, playing a musical instrument, or others common to his age-mates may experience frustration in his early attempts in these activities, or he may feel left out if he does not try to participate. Usually the level of skill or knowledge itself is not as critical as the way in which the individual perceives it. In situations in which the person must perform but feels that he cannot do so well as he desires or so well as others expect of him, he becomes frustrated. When frustrated, he may simply continue making the same responses though they do not achieve the desired end. In most situations an altered response is required rather than the same response repeated. And to make an improved response requires additional information or further practice of some skill. At this point the problem-solving approach to social and emotional problems can be as productive as it is when applied to more purely intellectual problems such as those encountered in science, mathematics, English, and other subject-matter fields. Once the new information or the higher-level skills are acquired, a situation which was frustrating can, when encountered again, be a source of satisfaction. Resolute trying is to be encouraged. Goal-oriented effort toward achievable goals is socially approved and, if developed in younger children, should prove useful throughout life.

REINTERPRETATION OF SELF-SITUATION RELATIONSHIPS. One difficulty in applying problem-solving techniques to frustrating interpersonal problems is that self-esteem cannot easily be maintained while the individual is securing information or developing the higher-level skill. The adolescent who is fearful of acting as announcer of the assembly program hesitates to ask for help from his teacher or classmates, feeling that this would lower his value in the eyes of the teacher or the classmates who selected him. Starting in the elementary grades, many children will not attempt a new activity in a group situation for fear of presenting an unfavorable performance or appearance in the presence of others.

In many situations where the individual feels inadequate, one means of adjustment is through reinterpretation of the self-situation relationship. If the classroom is a nurturing and supporting environment, as it properly should be, the student recognizes that the teacher and classmates are helpful people. They want to help him learn and are not negatively critical. The teacher can do much to create this type of environment and to facilitate the reinterpretation process. Obviously if the teacher often disapproves or encourages class members to be highly critical of one another, reinterpretation of the self-situation relationship by the student who is experiencing frustration will achieve negative rather than positive results.

PURSUIT OF A SUBSTITUTE GOAL. Sometimes effort to reach an unattainable goal is stopped and an attainable goal is substituted. In tryouts for the athletic team, the play, the music festival, the art exhibit, some who try out are not accepted. Frustration can be quite intense for those who highly desire to be accepted but are rejected. In some cases, continued trying may lead to acceptance; in other cases, the teacher's best judgment may be that the individual does not and probably will not have the needed knowledge, skills, and other characteristics to be accepted. These latter individuals need help in identifying and accepting substitute goals that are attainable.

In helping students find appropriate substitute goals—an acute problem for many high school students and their advisers in connection with choice of courses and vocations—one has at least three concerns: to make certain that a student does not give up his original goal if he has reasonable possibility of success; to try to find a substitute goal, if a substitute seems advisable, that will help the student satisfy the same needs as his original goal would have satisfied; to be particularly careful about suggesting a substitute that involves little or no opportunity for achieving an equally desirable end.

For example, the tenth-grader who desires to be a scientist but is having difficulty in chemistry should not be encouraged to accept a substitute goal if there is reason to believe that he may do better in this and other science courses with improved or more persistent efforts. If this student is of average intelligence and has, with great effort, performed at a mediocre level in previous science and mathematics courses, a substitute goal for course work in high school and an eventual career must be considered. Perhaps the student's interest in science and his apparent need to use science could somehow be related to mechanical drawing, advertising, or the like. Instead of the more difficult science and mathematics courses, general courses could be substituted. It would seem most unwise, however, to deny the student any goal in connection with science by not permitting him to take any science courses in his last three years of high school. Further, suggesting at this point that he change his choice of career to a manual-labor or clerical occupation might not satisfy his perceived needs and might not be a desirable goal for him. Unfortunately, in many cases, students, parents, and teachers do not and cannot have all the information needed to help students find adequate substitute goals, though it is apparent, in some cases, to all of them that an original goal must be abandoned. High respect for the student and an attitude of patient trial-and-confirmation are needed in these situations.

WITHDRAWAL. To avoid bodily injury and maintain physical health we must avoid many harmful situations. We do not dive into deep water unless we can swim, nor do we plan a long trip in an automobile when the roads are icy. Sometimes we must also avoid situations which might be detrimental to our emotional well-being. Many adults deliberately excuse themselves from a discussion if they know that someone in the group is likely to become emotionally upset or abusive. If a person already has experienced unpleasant emotions in a first situation, he reasonably avoids the same situation until he can acquire knowledge or skills to meet it more adequately. But the individual, facing many potentially harmful situations daily, cannot avoid or withdraw from all of them and be reasonably well adjusted. Escape from meeting important life situations by chronic and repeated withdrawal eventually leads to severe maladjustment.

Permitting or even encouraging occasional avoidance or withdrawal from some activities in the classroom and the school achieves better results than continuous forcing. The high school girl who comes to class in an ill-fitting dress or who feels that her appearance for any reason will be pitied or disapproved by classmates should not be forced to rise when speaking or reciting. Many elementary, high school, and college girls come from economic backgrounds that do not permit large expenditure on clothing, hairdressers, and other niceties that some of their classmates may enjoy. Similarly, some children and youth do not go on vacation trips or engage in other prestige activities during the summer recess; older ones may work at many jobs for little money or idle away time because they cannot find work. For this reason, if there is class discussion of the interesting things done during the summer, participation in the discussion should be voluntary, not forced. As children are taught to avoid some physically dangerous situations and are given help to acquire information and skills to overcome other such situations, so also potentially frustrating and personality-damaging situations should be handled.

AGGRESSION AND RELATED REACTIONS. Aggression, as used here, designates hostility directed against the perceived source of frustration—usually another person, although the source might be an object or oneself. Aggressive reactions are hostile attacks with the purpose of removing or injuring the source of the frustration. Aggression with physical reactions is often observed in smaller children; one child takes a toy from another and hitting, biting, scratching, gouging, or hair-pulling ensue. In older children and adults aggression generally takes the form of verbal attacks.

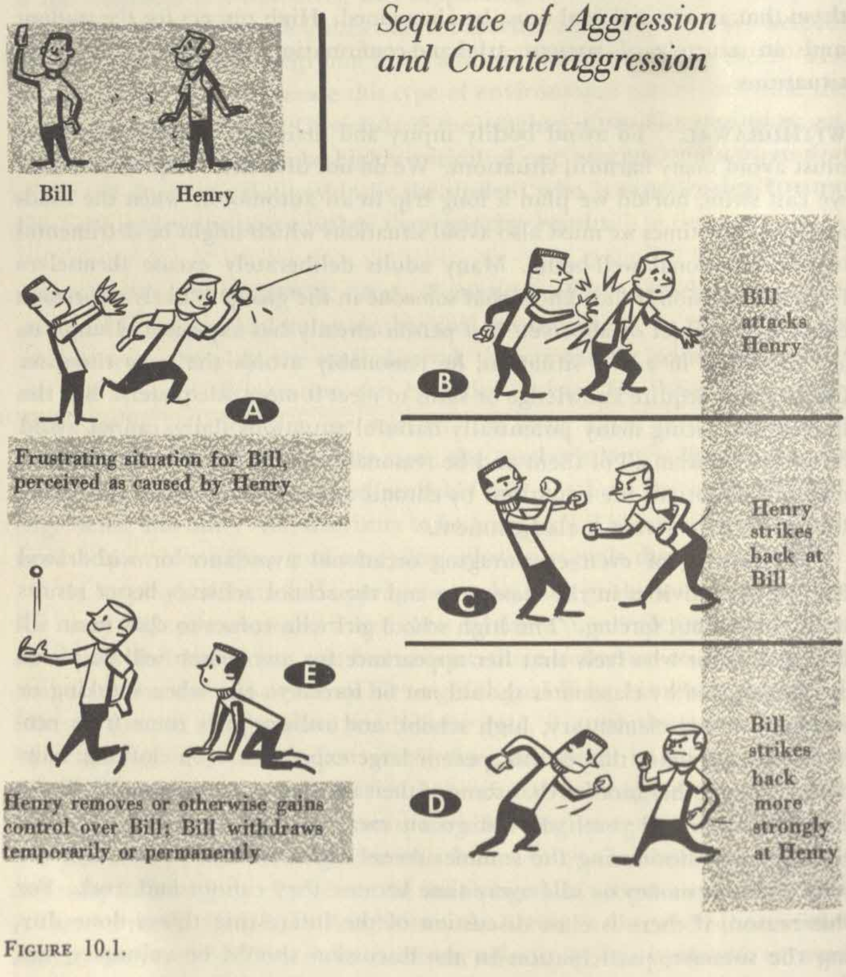
Sequence of Aggression and Counteraggression
Bill
Henry
A
Frustrating situation for Bill, perceived as caused by Henry
B
Bill attacks Henry
C
Henry strikes back at Bill
D
Bill strikes back more strongly at Henry
E
Henry removes or otherwise gains control over Bill; Bill withdraws temporarily or permanently

FIGURE 10.1.

Figure 10.1 shows a sequence of aggression and counteraggression between two individuals. Bill frustrated by Henry (A) attacks him (B). Henry strikes back (C); Bill retaliates more strongly (D); but Henry overpowers him (E). Bill, in turn, may withdraw or acquiesce outwardly, or both boys may reinterpret the self-situational relationship and return to a status as preceding the frustrating situation.

Aggressive reactions in American culture are widespread and, at least in younger children, are approved by many adults. Quite early in life children recognize their own physical strength and verbal abilities, and some learn to achieve their ends primarily through aggressive acts. So pervasive is this early learning that it is subsequently used in adolescence and adulthood as the most immediately available response to many life situations. Aggressive reactions, though perhaps necessary for personality development and for relieving tension, are not generally effective in achieving solutions to our many complex social problems in the home, school, or society.

Solutions attained by superior force are accompanied by submission or lack of resistance in others. In many situations the weaker individual cannot strike back against the frustrating person in the position of authority. This often leads to displaced aggression. The child, frustrated by the teacher but unable to withdraw from the situation, does not strike back physically or verbally. Instead, he tears up his book or other material, breaks his pencil, slams a door, and the like. Or, upon arriving home, he may kick or otherwise hurt his dog—not because the dog has hurt him but as a means of showing his superiority in a fashion similar to the teacher's power over him. Also, the individual who cannot strike back against a more powerful figure may turn his aggressive feelings inward, blame himself, or otherwise punish himself as a means of relieving his tension. Response to aggression varies with the situation and the personality of the individual, as will now be seen.

Otis and McCandless (1955) investigated the relationship between certain needs of children and the direction of their responses in experimentally created frustrating situations. The experiment was so arranged that tension was produced. (Appropriate techniques were applied after the experiment to counteract these effects and return the children to their pre-experimental condition.) Aggressive behavior increased from the first four to the last four trials with a corresponding decrease in submissive–complaisant behaviors in all children. Those children rated as having high power-dominant needs showed more aggressive reactions than did children rated as having love-affection needs. The children with high love-affection needs showed less increase in aggressive behavior and more submissive-complaisant behavior. The boys as a group demonstrated more aggressive and less submissive-complaisant behavior than girls. Also, children who had attended the permissive experimental preschool for a longer period of time exhibited higher aggression and lower submissive behavior during frustration than did children who had very recently come to the school.

Bennett and Jordan (1958) investigated the extent to which personally secure and insecure college students varied in types of aggressive reactions to an experimentally induced frustration. Though the differences were not large, the insecure group was more extrapunative—that is, they showed greater hostility or greater aggression against persons or against things—than did the more secure group. There was no difference between the two groups in the extent to which they blamed or punished self. One concludes from both experiments that children of preschool age with high love-affection need and secure college students less frequently resort to aggressive reactions in frustrating circumstances than do children with high dominance needs and personally insecure college students.

SUPPRESSION AND RELATED REACTIONS. *Suppression* implies a form of self-control by which emotional reactions or tendencies to action are kept from overt expression. *Repression* implies the same process except that it is at a less conscious level. *Daydreaming* and *fantasy* permit the individual to escape from reality and to carry out his desires imaginatively. *Rationalization* implies concocting ideas and justifying them on individually approved rather than generally approved bases. These forms or mechanisms of adjustment enable a person to meet a frustrating situation without taking goal-directed, aggressive, or any new overt actions to meet situations. Most, if not all, of us at one time or another use all of them without always being aware that we are doing so.

These, like other adjustment techniques, are neither desirable nor undesirable in themselves, but if they are used in meeting a large number of situations for long periods of time, the effect is highly undesirable. Suppressing and repressing such emotional feelings as jealousy, anger, fear, affection, and elation repeatedly leads to physical illness as well as to severe psychological disturbance. Fantasy can be used to avoid so many important life situations that eventually the individual creates a world out of his fantasies and loses touch with reality. Chronic rationalization can also lead to much unethical behavior which the individual interprets as reasonable and appropriate to himself and the situation.

Observant teachers can detect the utilization of many of these mechanisms in students, but what to do about them is not well understood or agreed upon. As will be suggested in later discussion of principles of personality integration, attempting to create and maintain a secure emotional environment in the classroom is a positive approach to the problem.

ANXIETY AND RELATED REACTIONS. Anxiety, different from most other means of adjustment, is not so much a response to frustration as it is a fusion of low fear with the anticipation of possible failure or punishment in the future. Sometimes the source of the anxiety is not clear to the individual.

Mild anxiety with a low degree of tension, particularly in problem-solving situations, is not harmful to learning; Symonds (1958) considers it a positive motivation influence. He proposes, however, that the teacher should not deliberately create frustrations or arouse anxiety because most learning situations are sufficiently frustrating and anxiety-producing in themselves. The better approach is to reduce rather than to increase anxiety in the learning situation.

One experimental procedure for learning more about the nature and effects of anxiety is to arrange situations in which an experimental group is put under stress and a control group is not. Another is to correlate measures of anxiety with measures of performance. Palermo, Castaneda, and McCandless (1956) investigated the relationship between anxiety and performance on a fairly complex task, using fourth-grade children. The results, partly shown in Figure 10.2, are for two groups having the highest and the lowest scores on a paper-and-pencil test of manifest anxiety. The group of children having the low-anxiety scores made consistently fewer errors in performing the task than did the high-anxiety group, suggesting that high anxiety reduces efficient performance.

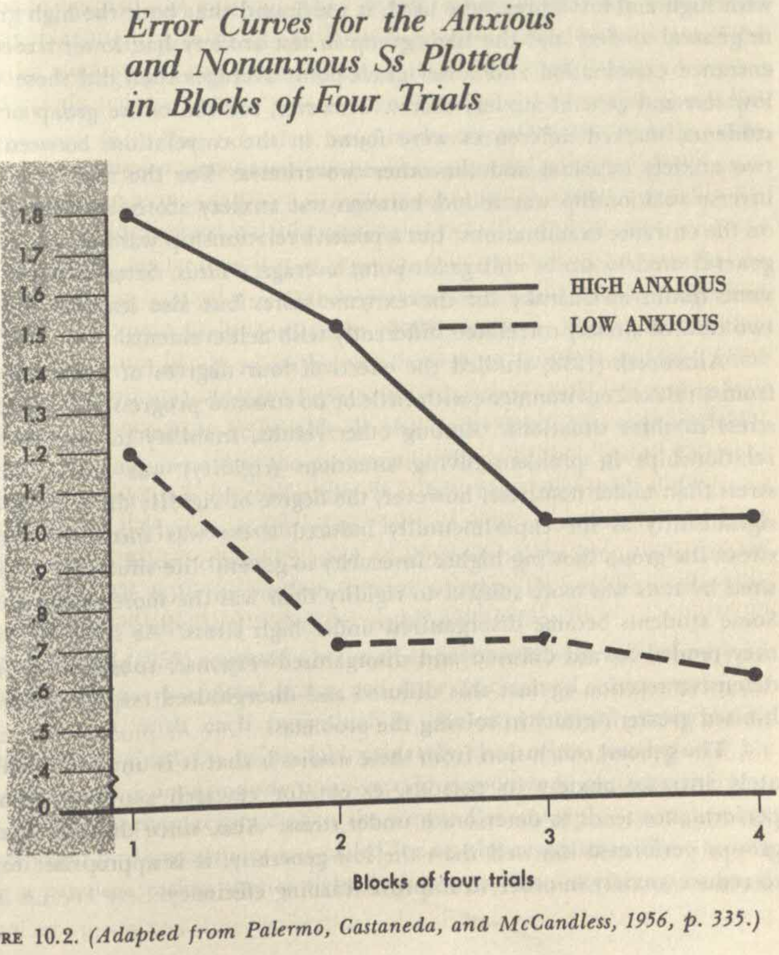

FIGURE 10.2. *(Adapted from Palermo, Castaneda, and McCandless, 1956, p. 335.)*

Chansky (1958) first adminstered an anxiety test to college students and then placed the experimental group under induced stress while they took a series of three reading tests. The control group was not placed under stress during the tests. The more anxious students scored lower in reading speed, reading comprehension, and recall of what was read seven days after the test. From the first to third test in the series, however, a tendency was found for the more anxious students in the stress situation to score somewhat higher on reading comprehension than did those showing low anxiety. Thus, the effects of anxiety when measured by a pretest and anxiety when it was induced in the situation had somewhat different effects on reading behaviors.

Sarason (1957) studied the entrance examination scores and grade-point averages of a group of university students in relation to anxiety scores on a test of test anxiety and a test of general anxiety. When only students with high and low scores were used, it was found that both the high group in general anxiety and the high group in test anxiety had lower scores on entrance examination and lower grade-point averages than did those with low test and general anxiety scores. However, for the entire group of 305 students, marked differences were found in the correlations between the two anxiety measures and the other two criteria. For the total group an inverse relationship was found between test anxiety scores and the scores on the entrance examinations; but a positive relationship was found between general anxiety scores and grade-point average. Thus, Sarason found the same results as Chansky for the extreme scores but also learned that the two tests of anxiety correlated differently with achievements.

Ainsworth (1958) studied the effects of four degrees of stress, ranging from a relaxed environment with little or no stress to progressively increased stress in three situations. Among other results, inability to perceive new relationships in problem-solving situations (rigidity) was greater under stress than under nonstress; however, the degree of rigidity did not increase significantly as the experimentally induced stress was increased. Under stress, the group showing higher insecurity to general life situations as measured by tests was more subject to rigidity than was the more secure group. Some students became disorganized under high stress. As stress increased they tended toward diffused and disorganized response; subsequently, as a defensive reaction against this diffused and disorganized response, they exhibited greater rigidity in solving the problems.

The general conclusion from these studies is that it is unwise to deliberately increase anxiety in persons, except for research purposes, because performance tends to deteriorate under stress. Also, since the high-anxiety groups performed less well than the low generally, it is appropriate to try to reduce anxiety in order to improve learning efficiency.

Integration of Personal Needs and Social Demands

Living represents a rather continuous series of adjustments between satisfaction of individual needs and satisfaction of the demands of the groups to which one belongs. Maslow (1948) organized a hierarchy of needs as follows: physiological needs, safety needs, love and belonging needs, esteem needs (needs for achievement and recognition), self-actualization needs, and desires to know and understand. These will be treated more fully in Chapter 11. The demands placed upon the individual range from codified laws to unwritten customs, traditions, and taboos; these demands, as applied to children, vary somewhat according to home, neighborhood, school, and church background.

In the school situation directly, demands are initiated and enforced by the school generally, the teachers, age-mates, and others. Early in school life children are expected to control or schedule their needs for eating, eliminating, being active, and resting. Also, certain safety regulations which must be adhered to are prescribed. In satisfying other needs, such as needs for love and belonging, esteem, and self-actualization, children have somewhat more freedom—if not within a particular classroom, then within the larger environment, including extraclass, neighborhood, and home activities. The desires to know and understand can be met successfully in the school situation; but here, too, the student is not given complete freedom to decide what is most worth while to know and understand.

Various degrees of integration of personal needs with social demands are found in children and adults. One important dimension in this integration is rebellious independence–conformity. Fairly early in life, especially during school years when age-mates become important to the individual, some persons develop a high degree of conformity to group standards and values. Conforming is entirely acceptable if the individual has independently arrived at the judgment that the particular code or value is good. There is, however, another type of conformity that has been discussed widely and investigated somewhat in recent years. In this type of conformity the individual seems to have acquired a need to conform to the group whether or not the situation calls for conformity and whether or not the conformity agrees with the individual's already established values.

Crutchfield (1955) reported a series of experiments with college students and other adults. A control group and an experimental group were generally arranged, with each individual in the experimental group being deliberately deceived by being told privately that other members of his group had agreed unanimously upon certain responses to situational items. Each individual then responded to the items. For example an expression of agreement or disagreement was called for on this statement· "Free speech being a privilege rather than a right, it is proper for a society to suspend free speech whenever it feels itself threatened." Whereas only 19 percent of the control subjects expressed agreement with the statement, 58 percent of the experimental subjects (each of whom had been told that the group agreed to it) did so.

Another item on the same list was as follows: "Which one of the following do you feel is the most important problem facing our country today? (1) Economic recession; (2) educational facilities; (3) subversive activities; (4) mental health; (5) crime and corruption." Before answering, each member of the experimental group was told privately that "subversive activities" was unanimously agreed upon by their group as the most important; the control group was not given any information. Forty-eight percent of the experimental and 12 percent of the control subjects chose "subversive activities" as their answer to the item. The difference between the control and the experimental group on both items suggests that group pressure is important in securing conformity and that some individuals conform to be like the group rather than to assume initiative and responsibility for forming and expressing their own opinions. It is this kind of conformity which is undesirable.

Another kind of integration of personal needs and societal demands is shown by the individual who at some time in his life, usually while young, accepts a verbalized set of principles (such as the Ten Commandments) and specific interpretations of them to guide his behavior. Although the ethical values implied in the Commandments are perhaps appropriate to most people in Western civilization, the individual is taught a narrow interpretation which he internalizes but which leads to difficulty in situations where other interpretations and other religious beliefs are involved. The person with a narrow conception of the Ten Commandments and other precepts of Christianity experiences difficulty in associations with members of the Jewish faith or non-Western religious groups. At college, for example, a person who subscribes to narrow interpretations of specific religious teachings—whether Protestant, Catholic, Jewish, or non-Western—may also want to be accepted by members of groups that hold different religious values and beliefs. In this situation the person experiences conflict in that the precepts he adheres to result in frustration of other needs. Thus, though many college students have little quarrel with the ideas embodied in the Commandments, they may, in attempting to apply them narrowly, experience serious conflict with self and with others, especially in connection with dating and marriage.

Cronbach (1954) differentiated five levels of character which are descriptive of integration of personal needs and meeting social demands as discussed above:

> One might distinguish between the five levels in this way. The amoral person has learned of no values beyond immediate pleasure and displeasure. The self-centered person has become aware of ethical values or group standards but disregards

them. The conventional person wants to do as others do, and this aim is more compelling for him than any abstract moral idea. When he cannot conform he is uncomfortable; when the group abandons some former value, he also abandons his attachment to it. The conscientious individuals are emotionally attached to value ideals, which they use to judge any proposed action. The irrational-conscientious are emotionally bound to an abstract or verbal principle. They have to avoid, on principle, whatever they have been trained to abhor. This is different from the rational-conscientious person who is concerned with effects rather than with verbal labels.

The person with rational character is also committed to some basic goals or values, but he knows how they fit together and holds only a few standards as inviolable. Judgments regarding minor values are made in terms of the effects of each choice. Sometimes departing from a principle such as truthfulness may seem wise in order to attain some higher value. Thus the rational-conscientious person adheres neither to the group example nor to abstract "laws" of morality; for him, a conflict situation calls for reasoning [Cronbach, 1954, p. 586].

Adequate Self Concepts

The self concept is what the individual refers to as "I" or "me" and is the totality of meanings, attitudes, and feelings which the individual has of himself—the most complete description one could give of his present self. The self concept develops over a period of time and is quite largely learned, albeit incidentally and in part through conditioning, identification, and imitation, as well as more purposefully. The infant is not aware of himself as a person, but as he grows and learns he acquires an awareness of self. This awareness subsequently broadens to include more complete interpretations. With increasing age the self concept becomes quite stable; the individual does not markedly change his attitudes, feelings, or ideas about himself. To illustrate, a prospective teacher may think that she is quite attractive, has acceptable social attitudes and goals, and is congenial but with enough independence to maintain her self-esteem and individuality in thought and action. She sees herself as a fairly desirable person and has interrelated many important facets of her own life. She has an adequate and well-organized self concept.

The self-ideal is the desired self—what the person most wishes to be like and to do. The discrepancy between the self concept and self-ideal is to some extent a measure of maladjustment. The person who is strongly dissatisfied with present self but has accepted a high self-ideal may be overly anxious and unhappy and make poor adjustments in present situations. Persons dissatisfied with present characteristics or behaviors that are not subject to much change can internalize a self-ideal which cannot be achieved but which serves as a basis for continuing self-criticism. Regardless of age, being a reasonably well-integrated personality calls for a fairly high degree of acceptance of present self, fairly comfortable feelings in a variety of present situations, and sufficiently stable self-perceptions whereby most situations encountered do not threaten one's feelings toward self as a worthwhile individual.

Though of fairly recent origin and incomplete, our knowledge of self and self–other relationships is increasing. Berger (1952) measured self-acceptance and acceptance of others in three groups of varying age and occupational backgrounds. He obtained positive correlations ranging from .36 to .70, between scores of self-acceptance and acceptance of others. On the basis of these positive moderate-sized correlations, Berger concluded that self-acceptance and acceptance of others are positively associated. This, of course, does not indicate which is cause and which is effect.

Fey (1957), experimenting with college students, accepted the idea that high self-acceptance scores of an individual might indicate healthy adjustment or a relatively high degree of defensiveness and morbidity. His main findings were (1) students high in self-acceptance but low in acceptance of others overestimated their personal acceptability to others while ascribing degraded motives to others about them; (2) those high in self-acceptance and also high in acceptance of others were healthiest in their positive confidence in self and others and asserted considerable self-determination and acceptance of personal responsibility for conduct and actions; (3) those low in acceptance of self and high in acceptance of others shunned leadership almost completely; and (4) those low in acceptance of self and also low in acceptance of others, distrusting self and others, exhibited high anxiety, impulsivity, low morale, overdependence, and a marked tendency to accommodate others. Though how an individual acquires high self-acceptance and high acceptance of others is not discussed by Fey, the indication is clear that students with these characteristics are emotionally healthiest, have a positive, confident faith in mankind, assume personal responsibility, and exercise leadership.

Some work has been done to ascertain means of improving the self concept. Perkins (1958), working with fourth- and sixth-grade children and their teachers, found that an in-service program to help teachers understand the self concept in children and to apply such knowledge to themselves led to improved self concepts in the pupils. Also, the self concept and the ideal self of the children became increasingly congruent through time with greater congruency for girls than for boys.

Instruction during Grades 6 to 8, designed to help children acquire a more understanding and analytical approach to their own and others' behavior, resulted in higher self-acceptance and lower feelings of anxiety and insecurity in the children (Bruce, 1958). College students became more positive toward themselves and also toward the experimenter when favorably evaluated by the experimenter (Harvey, 1958). Authoritarian and more rigid individuals responded less well toward self and to the favorable evaluations than did those who were less authoritarian. Negative evaluations by the experimenter did not lower the student's self-evaluations as much as positive evaluations raised them.

Caplan (1957) arranged a situation in which boys experiencing behavior problems in school met in small groups for ten 50-minute counseling interviews with their regular high school counselors. In early meetings in the fairly permissive environment arranged by the counselors, the boys spent a considerable amount of the time relating lurid stories of their real and fancied misdeeds. Once the boys were satisfied that the counselor could be trusted, they released many violent and aggressive feelings, some against the school, some against teachers, and some against parents. In the later sessions they discussed freely with the counselor their in-school behavior, rules and regulations set up by the school, and other requirements that had been placed upon them. The boys' concepts of themselves as worthwhile individuals improved from beginning to end of the group counseling, and resulted in a desirable change in attitudes and behavior toward self and then toward others.

PRINCIPLES FOR ENCOURAGING PERSONALITY INTEGRATION

As has been shown throughout this chapter, personality integration is concerned with total behavior, including emoting, thinking, and doing, and is an important objective of the school as well as of each individual personality. Though it is an important objective, Table 10.1 showed areas of disagreement among leading theorists about the nature of personality. Also, a multitude of books and articles has been written about proper methods of rearing children, but the proposals are often contradictory. And though much research has been completed about the learning of facts, concepts, and problem-solving skills and a considerable amount about emotional learnings, few researchers have studied the possible relatedness of affective and cognitive learning (Scheerer, 1953).

With these qualifications, eight principles are now suggested as useful for encouraging personality integration:

1. Express feelings and values.
2. Develop an emotionally secure environment.
3. Encourage self-understanding and self-acceptance.
4. Aid the learner to set and attain realistic goals.
5. Provide practice in rational methods for meeting conflict situations.
6. Arrange appropriate situational contexts for practice and confirmation.
7. Use group techniques to facilitate understanding.
8. Encourage deliberate cultivation of personality integration.

These principles should be considered as useful hypotheses to guide behavior in teaching and other situations, rather than as established laws. Another person with a different concept of personality, analyzing the same large body of research and expert opinion, might arrive at some different and possibility contradictory judgments. Notice also that the last three principles are identical to three previously discussed in Chapter 9 except that the emphasis is on attitudes in Chapter 9, whereas here the emphasis is on total personality integration. The applications are so similar that these principles are not discussed further.

1. Express Feelings and Values

Feelings and ethical values are not characteristics that can be turned on and off like a light switch. One cannot simply feel as he chooses. If pupils persistently scuffle when they should be at work, the teacher cannot simply be happy and relaxed about the situation because he so chooses; he will probably tend to be somewhat angry and to show the anger. If the teacher firmly accepts certain ethical values, he cannot happily watch older pupils repeatedly violate them. Similarly, when pupils perform well, the teacher shows his pleasant feelings rather than withholding them. In such circumstances it is well to be oneself—especially to show pleasant feelings freely, but also to acquaint students with one's ethical values and to show disapproval if the misbehavior is such that one feels it requires disapproval. This principle should be interpreted to mean that the teacher exhibits not the worst, but the best in him. It implies also that the teacher has high self-acceptance, high acceptance of others, a well-organized and stable self concept, and is neither strongly self-centered nor has adopted rigid ethical values which he attempts to apply, regardless of the child's age, home background, psychomotor abilities, and cognitive characteristics.

Overstreet expressed a point of view about the member of a family that applies equally well to the teacher:

> We might set down here three insights that have become so well established that we can call them psychological axioms. One is that no human being can be his best self if he is always trying to be someone else instead of himself. The second is that he cannot be his best self unless he enjoys a reasonable self-respect and sense of worth. The third is that—particularly in childhood, but in some measure throughout life—his estimate of himself reflects the treatment he receives from the key figures in his environment; it is not something he makes out of nothing, but something he makes of other people's responses to him. As others see him, so he gradually tends to see himself [Overstreet, 1955, p. 91].

2. Develop an Emotionally Secure Environment

Emotion, as we have seen, can have an organizing or disorganizing effect and must be considered both as an aspect of motivation and as a response to situations. The classroom environment, perhaps more than the organized subject matter, serves to facilitate personality integration. In the emotionally secure classroom, standards of conduct are understood and accepted, feelings of acceptance and belonging are encouraged, pleasant emotions are freely expressed, help is given with unpleasant emotions, frustration and anxiety are reduced, friendly interactions are promoted, and zest for learning is high.

Standards of Conduct. Children and youth feel quite secure emotionally if the demands on them are made known and are consistent. Insecurity develops in a highly permissive group situation where inexperienced or immature members must originate their own standards, or in a situation wherein the demands vary from day to day or are inconsistently enforced by the leader. Most pupils do not resent reasonable rules and regulations; on the contrary, they prefer to know the kind of behavior that the leader will consistently approve or disapprove. They often test the new teacher to ascertain what the limits are. Particularly in the upper elementary grades and high school, an effective means of getting behavioral standards clarified and accepted by the pupils is to have them participate in the formulation. This technique has proved useful in a variety of usual school situations, as well as in high school classes composed of students already apprehended by the law but attending school while on probation. In many instances, older students come up with reasonable proposals to guide their conduct and try to live up to them.

Feelings of Acceptance. A feeling of acceptance and belonging to the group is important in achieving an emotionally secure classroom. This does not mean that the teacher must spend a great deal of time to make it obvious that he accepts each student in the class. Rather, as the learning activities start and progress, the teacher shows in facial expressions and words that he is pleased to have each student in his class. Misbehaviors are corrected and occasionally an individual may be privately reprimanded or punished. Though it is relatively impossible for the younger child to disassociate himself from his conduct, the teacher can make it clear that it is the misbehavior which is disapproved.

Emotional Expression. Pleasant emotions are too infrequently expressed in many classroom situations by both the teacher and the pupils, and there is probably too much suppression of feelings generally. In the kindergarten and primary grades the tendency is for the teacher to express her own pleasant feelings quite freely and to encourage pleasant emotional expressions in pupils. However, as the demand to learn more organized subject matter increases, both the teacher and pupils sometimes feel that not nearly enough is being accomplished, with the result that there are few happy experiences and pleasant emotional expressions in the classroom. As was shown in Chapters 3 and 9, interest and liking for school decreases from first to sixth grade, and schooling becomes less pleasant for a variety of reasons. The emotional atmosphere might be improved if the instructional program elicited more pleasant reactions and if time were spent to help youngsters deal more effectively with their unpleasant emotions at the time they are experienced.

Reducing Frustration. Frustration and high anxiety reduce learning efficiency. In our increasingly complex society, children and youth experience many unavoidable frustrations and accompanying anxieties, as do some adults, including teachers. The role of the school and the teacher is to reduce frustration rather than to deliberately arrange frustrating situations. It is clear from the experiments reported that high stress can be induced in people by one who has sufficient control over their lives and activities. High frustration with accompanying lack of need satisfaction results in undesirable responses such as aggression, disorganization, regression, rigidity, and anxiety. Nosebleeding, severe headache, frequent need to go to the bathroom, muscular tics—all possible symptoms of severe emotional strain—are sometimes induced by placing too heavy demands upon children and youth in situations in which they are forced to remain. And it is difficult to purposefully arrange work activities and assignments in such a way that some pupils do not become highly frustrated because they misinterpret or perceive differently the demands of the teacher. A fine balance, often hard to achieve, must be maintained between encouraging persistent trying and accidentally creating too much tension, with resulting inefficiency and personal disorganization.

Friendly Interactions. Having one or two good friends in class and being able to discuss interests and problems that have arisen are important for personality integration in children and youth. A most constructive goal of the teacher is to make sure that each child in the room has one or more good friends. Further, elementary and high school students desire membership in groups. Occasional class discussions and appropriate reading material can provide the informational bases for making friends and affiliating with groups. The cliques and crowds with ethical standards contradictory to those generally accepted usually cannot be broken up by rules and regulations because the cliques satisfy the members' needs for affection and friendship. Rather than attempting to separate friends or to sever friendships, the better procedure generally is to help these students as groups to reappraise their attitudes, values, and behaviors.

Zest for Learning. Most observers of young children marvel at their exploratory behavior. Young children raise all sorts of questions about themselves and their environment. They are curious and want to learn. For many children this zest for learning is somehow blunted during elementary and secondary school years by restriction arising in the home, the neighborhood, and the school. Beginning in the first grade, the urge for activity which leads to new discovery is thwarted by the pressure to conform to a confining situation, the classroom. Answers which the child wants to solve an important problem are deferred because the problem which an adult wants solved takes precedence. Teachers often feel, too, that it is their job to give answers rather than to help pupils find the answers. Mastering specified learning tasks suited mainly to the middle group of students becomes more important than does encouraging them to raise questions and seek solutions. Eventually the student no longer finds a challenge in the classroom learning situation; his previous eager searching for solutions becomes passive tolerance or even open resistance. When this situation occurs various undesirable means of adjusting, such as suppression, daydreaming, repression, and aggression, become prevalent. And it is relatively impossible to have an emotionally secure classroom environment when even a minority feel that there is nothing worthwhile for them in the classroom situation.

3. Encourage Self-Understanding and Self-Acceptance

By the time the student finishes high school, he should have a fairly realistic appraisal of himself, his motor skills, his knowledge and intellectual abilities, his interests, and his emotional make-up. One of the weaknesses of our total educational program, including undergraduate and graduate education at the college level, is that we do not give sufficient help to students in understanding their strengths and weaknesses. Often the high school or college counselor has made a fairly adequate appraisal of the student's assets and limitations and has used this for placing him in various curricula and classes. However, the information on which the appraisal is based is not interpreted to the student so that he can understand his strengths which may be capitalized upon, weaknesses which may be overcome through persistent effort, and possible limitations which cannot be overcome but must be accepted.

Besides some inadequacies in encouraging self-understanding, there is even less deliberate attempt to encourage self-acceptance. Rather than helping students accept and appreciate their special individual selves, we encourage unrealistic striving: "Anyone can become President of the United States." "Everyone should make a perfect score on this test." "Everyone should finish in ten minutes." Similarly, the grading system of "A-F" or "H-S-U" tends to encourage lack of self-acceptance except in those who receive high marks. Though giving students low or failing marks may encourage self-understanding and realism, it does not lead to self-acceptance, especially if the idea is also expressed that one should not be satisfied with low marks even though he has done his best.

Though desire to improve and some dissatisfaction with present performance are necessary for progress, concurrent self-rejection or unrealistic striving also lead to poor personality integration and, at times, to deliberate violation of ethical principles. The person who continuously strives for higher success than that attained does not get reasonable satisfaction from his achievements. Many American children and adults are not satisfied with achievements adequate for themselves; they are dissatisfied unless they are the wealthiest in their group, the highest in the class, the best athletic performer, and the like. And much of the deliberate cheating and rationalizing of unethical behaviors among high school and college students and in human affairs generally results from this compulsive desire to appear better to others than one is.

4. Aid the Learner to Set and Attain Realistic Goals

A considerable number of adults still believe that the pupil ought to experience failure in school as preparation to meet failure in adult life. However, research and empirical evidence show that highly productive, happy adults have a backlog of previous successes starting in childhood, and that repeated successes do not necessarily lead to an inflated opinion of self nor to undue self-centeredness. The ability to meet highly frustrating circumstances, including the possibility of failure, requires confidence gained from success experiences and feelings of security with oneself. Our psychiatric wards and penal institutions are occupied largely by persons who have repeatedly experienced failure in many important life situations, including the home and school.

As discussed in the preceding section, it is important that pupils not only learn to understand themselves but also have experience in setting and reaching goals. Most pupils set their sights too high with respect to their anticipated achievements in learning tasks such as spelling, arithmetic, science, or other fields. With the recent emphasis on education in science and mathematics as preparation for careers in engineering or science, high school students of relatively low ability are taking more of the advanced classes in science and mathematics. Large numbers of them, however, are experiencing failure rather than success while in high school. And many graduates of lower abstract abilities who matriculate in the various colleges and universities are disappointed and at times become seriously disturbed upon being dropped for academic failure. As will be discussed further in Chapter 11, some goals are set too low, and this also does not facilitate personality integration.

5. Provide Practice in Rational Methods for Meeting Conflict Situations

Conflict situations between teacher and pupils and among groups of pupils inevitably arise. A first response to such conflict situations is often emotional. We expect younger children to respond with rather free expression of emotions in conflict situations, and this free emotional expression tends to relieve tension; however, it does not resolve the conflict. If we are to make progress in human affairs, more of such conflict situations as those between minority–majority groups, labor and management, and among nations will have to be solved on an increasingly higher level of rationality and with less emotionality. Youth in school today need practice in rational or intelligent methods for meeting the various conflict situations in which they find themselves.

Conflict situations in school may provide the basis for fruitful learning experiences to promote personality integration. As was suggested in the previous chapter, role playing, group discussions, and group decision-making in the classroom promote better understanding of social and ethical values and acceptance of such values. Disagreements among pupils about such matters as responsibility for performing various tasks, appropriate conduct, and the cause of conflict between students or groups can initiate a role-playing situation or a group discussion in which the emphasis is on rational means of solution rather than on debating, arguing, blaming, and punishing.

SUMMARY

One's personality affects his responses to others and elicits responses from others. Personality integration implies adjusting to society sufficiently well to be acceptant of self and others and to modify the self, the social world, and the physical world in order to improve them. The well-adjusted person has internalized rather than rejected the ethical values of his society, is self-respecting and respects others, and exerts a positive rather than a destructive influence on others.

The bases of personality integration, acquired mostly through learning but also dependent upon maturation and a variety of biological and cultural factors, are health and psychomotor skills, satisfying emotional life, knowledge and related intellectual skills, adequate means of psychological adjustment, integration of personal needs and social demands, and an adequate self concept.

The extent to which school personnel can or should influence the personality development of children and youth is not clear. But it is established that maladjustment is associated with inefficient learning of usual school subject matter and that an individual may acquire cognitive and psychomotor learnings which he uses subsequently with destructive effects on self, others, and things. The teacher who accepts responsibility for encouraging personality integration may be guided by these principles:

1. Express feelings and values.
2. Develop an emotionally secure environment.
3. Encourage self-understanding and self-acceptance.
4. Aid the learner to set and attain realistic goals.
5. Provide practice in rational methods for meeting conflict situations.
6. Arrange appropriate situational contexts for practice and confirmation.
7. Use group techniques to facilitate understanding.
8. Encourage deliberate cultivation of personality integration.

QUESTIONS AND ACTIVITIES

1. (a) Discuss the relationship between personality integration and character.
   (b) Evaluate Shoben's description of integrative adjustment, referring to the original article as necessary.
2. (a) Apply any three of the determinants of personality given in Figure 10.1 to your own personality integration.
   (b) Give the three determinants over which the teacher and school generally might exercise most influence and least influence as applied to children and youth. Give the reasons for your choices.
3. (a) Rate yourself on the six bases of personality integration, using an A to mean you are particularly strong in relation to it, B to indicate moderately strong, C to indicate moderately weak, and D to indicate particularly weak. You may wish to keep this rating to yourself.
   (b) Discuss the role of the teacher and the school in connection with each of them, as applied to students at any school level.
4. Discuss briefly each dimension of emotions: pleasantness-unpleasantness, organization-disorganization, motivation-response.
5. (a) Discuss the five criteria for evaluating the appropriatenesss of a child's means of adjustment.
   (b) Apply the same criteria to the one of seven forms of adjustment that you use most frequently.
6. (a) Give an example of each of the seven means of adjustment, applied to your own behavior.
   (b) In your opinion, which of the seven are less appropriate for a teacher than students? Why?
7. Discuss the relationship between anxiety and learning efficiency.
8. (a) Discuss the relationship between satisfying personal needs and meeting social demands.
   (b) Describe the type of conformity that is appropriate and the type that is inappropriate to personality integration.
9. (a) What is the self concept?
   (b) What is the relationship between the self concept and the self-ideal?
   (c) How is self-acceptance related to acceptance of others?
10. Describe what each of the eight principles for encouraging personality integration means to you in your relationship with students. Devote one or two paragraphs to each and include illustrations.
11. Describe how developing and maintaining an emotionally secure classroom environment assist students in handling frustrations.
12. Drawing from your own formal education, discuss the extent to which it has encouraged self-understanding and self-acceptance.
13. Describe the extent to which you are setting and achieving realistic goals.

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Part III *Desirable Conditions for Efficient Learning*

Learning outcomes such as those discussed earlier (Chapters 6–10) cannot be achieved efficiently unless there is high learner motivation. The importance of motivation will be discussed in Chapter 11. Also, the efficiency of acquisition is closely related to the permanence of learning and to its use in new situations, as will be shown in Chapter 12, Retention and Transfer. And as more is learned about the abilities and characteristics of individuals, differences within and among individuals can be more adequately provided for. Chapter 13 will discuss the relation of instruction to these differences. Further, the use of TV, teaching machines, electronic laboratories, and instructional teams, along with the growing knowledge of learning and teaching processes, require psychologists and educators to be concerned with new settings and contexts for learning. These will be covered in Chapter 14.

While research is proceeding at a rapid pace in connection with motivation, retention, and transfer, a vast amount of informal experimentation is being conducted in connection with exceptional children, large-group instruction by TV, individualized instruction with such aids as tape recorders and teaching machines, and with new administrative organizations for instruction. Experimentation in connection with the last three has not been initiated widely by psychologists, curriculum workers, guidance people, and teachers. Rather, administrators and others in institutions of higher learning, experts in such fields as mass communication and electronics, and persons connected with various educational fund-granting agencies have initiated most of it. However, the impact upon teaching and learning may be as great as is the impact of automation upon industry.

Chapter 11 Motivation

If all students wanted to learn what the school and teacher desired, and if all had the ability to perform the desired tasks efficiently, this chapter would be short. But some students are forced to go to school rather than desiring to do so; some do not want to learn what the school wants them to, at least not when and as the teacher desires; and some cannot perform the learning tasks well for a variety of reasons. Further, in some classrooms motivation for learning is exceedingly low in most pupils; in other classes of the same school, it is high. In this chapter the point of view is that the goal of the school and of the teacher is to arrange the situations so that most, if not all, learners want to learn, are confident that they can learn what the school desires, and believe that what they learn is worthwhile for them.

As discussed briefly in Chapter 1, motivation is an integral component of purposeful learning and is intimately related to efficiency, as will be explained more fully in connection with the following main topics: (1) clarification of terminology; (2) human needs; (3) goals and goal-setting; (4) cooperation and competition; (5) the nature of interests; (6) principles of motivation.

CLARIFICATION OF TERMINOLOGY

Some terminology about motivation has developed in experimental psychology to describe animal behavior, some in clinical psychology and psychiatry to describe abnormal behavior, some in industrial psychology to describe employer–employee behaviors, and some in educational psychology and education to describe human behavior in the school setting. In many instances the same term is used to indicate quite different phenomena. In part, the variety of terms and usages has arisen because the internal motivating state of the organism cannot be readily observed or measured directly, and inferences about internal behavior drawn from the same data are couched in different explanatory terms. The definitions and brief discussions which follow are intended to clarify usage in this book and to indicate the author's frame of reference.

MOTIVATION. Motivation is activity by one person designed to stimulate or arouse a state within a second person or group that under appropriate circumstances initiates or regulates activity in relation to goals; or it is the aroused state of the individual that under appropriate circumstances initiates or regulates behavior in relation to goals. A teacher, for example, arranges circumstances within the classroom to encourage pupils to make certain responses—to learn to spell certain words correctly, for example—rather than such other responses as talking with one another. The effectiveness of the teacher's motivational procedures is inferred from the direction, intensity, and persistence of the pupil's activities, including responses. This usage is applied in the later section of the chapter where principles of motivation are discussed.

Motivation also refers to the state within the learner without specifying the motive and is used particularly in describing intensity. Thus, after the teacher makes the attempt to encourage pupils to study, motivation in the pupils may range from very low to very high. This second usage is also applied in this chapter. Motivation is the most comprehensive term in this listing, and by different writers is used synonymously with *need* (deprivation), *drive,* and *goal-seeking.* The intensity and direction of pupil motivation in classroom settings is generally inferred from the pupil's activities and is not measured directly or objectively.

MOTIVE. A state within the individual that under appropriate circumstances initiates or regulates behavior in relation to a goal is a motive. Though the state is within the individual, a second person can manipulate the environment to arouse the motive. Motive refers to a more specific aroused state than does the second usage of motivation given previously. Drives, sets, needs, wishes, wants, predispositions, purposes, interests, values, and emotions are terms used by various writers to designate the internal states that energize and direct behavior to goals; these terms, rather than the term "motive," are used by some writers. Need is most nearly synonymous with motive and is now being given more general recognition by psychologists, educators, and teachers. Throughout this chapter, need gratification will be given prominent attention as one means of examining human motives.

NEED. A need is the lack of something which, if present, would tend to further the welfare of the organism or of the species, or to facilitate its usual behavior. This lack is experienced or felt within the organism and leads somehow to energizing and directing activity toward what is perceived as satisfying the need. The usual procedure is to describe human needs as relatively permanent tendencies associated with relatively specific goals, e.g., need to achieve, need for affection, need for sensory gratification. Most of these persistent needs can be satisfied temporarily, but then recur, with the seeking of gratification which, if successful, results in another temporary satisfaction. The physiological need for oxygen illustrates a rapid cycle in deprivation, satisfaction, deprivation; the need for affection is of greater duration and complexity. Needs of children can be inferred more readily than drive states (see below). Further, through attempting to ascertain which needs of the child are not being satisfied, the teacher may be able to ascertain why the pupil does not direct his activities toward the learning tasks.

DRIVE. A drive is a tendency initiated by shifts in physiological balance, tissue tension, sensitivity to stimuli of a certain class, and response in any of a variety of ways that are related to the attainment of a certain goal. *Primary drives* are unlearned and result from physiological imbalances which occur when certain essential substances such as food and water are needed. Sex and pain avoidance are often classed as primary drives. The usual procedure for producing drive in animal laboratories is to deprive the animal of food or water for a time long enough that it actively seeks food or water. Strength of primary drives is measured in amount of elapsed time since feeding or watering, and schedules have been carefully worked out for various strains of laboratory animals to determine the point at which further deprivation—say, starvation—produces decreased activity. In the case of painful stimuli, strength of drive in the animal is inferred from the degree of intensity of the stimuli, e.g., electric shock. Secondary drives are learned drives, such as anxiety and learned sexual states, and some writers treat all motivational states as either primary or secondary drives. Drive states cannot be readily manipulated or controlled in human subjects in classroom settings; one of the most widely accepted values about schooling is that children and youth are to be assured of the physical necessities of life—food, water, warmth, activity, rest, and freedom from harmful conditions—while in the school. The term "drive" is used in this book only in reporting experiments. The author is uncertain that the internal physiological state of the motivated child, trying earnestly to learn to read new words and enjoying the activity, is identical with or even similar to that of an animal that has been deprived of water for hours. In any event, the child's outward behaviors appear very different.

GOAL. The end result, immediate or remote, which the individual seeks is his goal. It may be to complete the writing of a theme, to become a scientist, to learn to spell a certain word correctly, to achieve a certain speed in typing at a specified point in time. As used in animal experiments, the goal of the animal is to get to food or water (not necessarily by learning the best route) after having been deprived. As used in connection with human learning, "goal" implies the end result which the individual seeks with awareness; inherent in such a goal as learning to spell five words correctly is the learning of the words. The relationship between learning the words and achieving the goal is *intrinsic* in that the goal cannot be reached without the learning.

INCENTIVE. An incentive is an object or external condition, perceived as capable of satisfying an aroused motive, that tends to elicit action to attain the object or condition. As applied to learning in school situations, an incentive might be grades or marks, merit badges, stars, or praise. If the learner seeks to attain a high mark, rather than to reach a higher level of performance or understanding, his goal might be set in terms of the desired grade, rather than in terms of the performance. Setting the goal of receiving an *A* illustrates an *extrinsic* relationship between learning and the goal in that the goal is to receive the grade, not to perform better. Motivational situations are highly complex and it is, of course, possible for the learner to perceive a close relationship between learning to perform the tasks well and to receive an *A*, particularly if the teacher clearly sets forth the relationship between performance and grades. In this book, the use of incentives by the teacher to motivate pupil learning is treated as different from working with pupils to set their own goals, to improve performances, and to complete classroom activities. Both are accepted as motivational techniques.

INTEREST. There is no doubt that individuals have preference for engaging in one activity over another and that many such preferences can be appraised quite reliably. This tendency to give selective attention to one activity or activities rather than to others is interest. Strong (1958), who has successfully measured interests in older adolescents and adults for many years, suggests that attitudes and interests have similar affective properties but that attitudes are organized around concepts or percepts whereas interests are organized around activities. When given the opportunity, children and adults readily select the activity most interesting to them; thus, one's already acquired interests have a directional effect on behavior.

CURIOSITY. Curiosity is different from interest in that interest implies selective attention to certain activities whereas curiosity implies the tendency to investigate and seek to learn more about new objects or phenomena with which there has been little or no previous experience. When an individual has much experience with an originally novel material or activity, he tends to lose curiosity but may acquire continuing interest.

TASK. An act, or the result of an act, that is required or demanded of an individual by another person or by himself is a task. Examples of school tasks are reading a chapter of a book, solving a problem, demonstrating a science experiment. A learning task does not suggest unpleasantness but simply something that is to be learned.

Unless the above definitions are now meaningful, it would be appropriate to return to them for further study. Should the reader already have acquired meanings and usages different from those accepted by the author, it would be well to substitute his own terminology in the subsequent pages.

HUMAN NEEDS

Unsatisfied needs, with their resulting tension within the organism, serve as motives to arouse and direct behavior toward goals which the individual perceives as satisfying the need and, thereby, reducing the tension. Though there are many classifications of needs, Maslow's economical list is first presented; then other needs not directly included in his statement are treated.

A Hierarchy of Needs–Motives

Maslow (1943) set forth a theory of human motivation which brought together many ideas proposed up to that time, and his theory still merits careful study by anyone who accepts the idea of human needs as being important in energizing and directing behavior. The needs in order of importance to the individual are: (1) physiological needs, (2) safety needs, (3) love and belonging needs, (4) esteem needs, (5) self-actualization needs, (6) the desires to know and understand.

Maslow lists physiological needs, such as for food, oxygen, and rest, that are necessary to maintain life and suggests that one could make an exceedingly long list, depending upon the degree of specificity of description desired—the specific minerals and vitamins alone could comprise a very long list. He makes two other important points related to the satisfaction of the physiological needs. First, an almost certain way of getting a lopsided view of human capacities and human nature is to make the organism extremely and chronically hungry or thirsty. Extreme hunger or thirst dominates the entire organism's behavior and gives a very untrue picture of most of his higher motivations, including the social. Second, gratification is more important than deprivation in motivational theory. Once the physiological needs are gratified, other more commonly observed human needs and related goal-directed behaviors emerge.

Safety needs in infants and children are demonstrated in their preference for some kind of routine or rhythm rather than disorder, the avoidance of various forms of perceived danger situations, and the withdrawal from strange and unfamiliar situations if they are perceived as eliciting danger and terror reactions. In general, the safety need in children and adults is observed as an active and dominant mobilizer of the organism's resources in emergencies—war, disease, injury, natural catastrophes, and the like.

The love need is described as a desire or a hunger for affectionate relations with people in general and for a place in the group. Strength of this need is observed in the person who feels keenly the absence of friends, wife or husband, children, or people more generally.

Esteem needs most clearly suggest receiving recognition as a worthwhile person. Satisfaction of the esteem needs is accompanied by feelings of confidence, worth, strength, and being useful and necessary. The thwarting of these needs produces feelings of inferiority, weakness, or helplessness.

The need for self-actualization is the need to be or to become the kind of person one desires to be, i.e., the tendency for the individual to become in actuality what he is potentially. Satisfaction of this need is expressed in various ways. One person becomes a good mother, another an athlete, another a musician, another a teacher, and so on. The person in whom these needs have been relatively well satisfied are the healthiest in our society.

Maslow was uncertain that the desires to know and to understand—cognitive needs—were as clearly established in all human beings as were the others. Though curiosity, exploration, and the desire to acquire further knowledge can be readily observed, they are more evident in persons of higher intelligence than in those of lower intelligence. Where the need is present and strong, it is accompanied by wanting to understand, to systematize, to organize, to analyze, to look for relations and meaning.

The order of the first five needs is important in that they must be satisfied in the order given; that is, the physiological needs must be satisfied before there can be satisfaction of the safety needs; similarly, the safety needs must be satisfied before the love and belonging needs can be. A summary statement helps to clarify the idea:

> These basic goals are related to each other, being arranged in a hierarchy of prepotency. This means that the most prepotent goal will monopolize consciousness and will tend of itself to organize the recruitment of the various capacities of the organism. The less prepotent needs are minimized, even forgotten or denied. But when a need is fairly well satisfied, the next prepotent ("higher") need emerges, in turn to dominate the conscious life and to serve as the center of organization of behavior, since gratified needs are not active motivators.
>
> Thus man is a perpetually wanting animal. Ordinarily the satisfaction of these wants is not altogether mutually exclusive, but only tends to be. The average member of our society is most often partially satisfied and partially unsatisfied in all of his wants. The hierarchy principle is usually empirically observed in terms of increasing percentages of non-satisfaction as we go up the hierarchy. Reversals of the average order of the hierarchy are sometimes observed. Also it has been observed that an individual may permanently lose the higher wants in the hierarchy under special conditions. There are not only ordinarily multiple motivations for usual behavior, but in addition many determinants other than motives [Maslow, 1943, p. 394–395].

Figure 11.1 visualizes the hierarchy of prepotency. The hierarchial aspect is shown by successive needs being built on the one below. The prepotency idea suggests that at any given time the esteem needs, for example, might take precedence over the love and belonging needs or the safety needs. Similarly, if the basic needs in the hierarchy are temporarily satisfied, the self-actualization need would determine the goals of the individual.

The above ideas have important implications for education. For example, the teacher wants the pupils to acquire certain knowledge, but it is possible that a particular child's needs for love or esteem are not satisfied. The child's goals to satisfy these needs take precedence in energizing and directing his behavior. A rejected child, for example, may have much stronger need for love and belonging than desires to know and understand and, therefore, directs his energy toward satisfaction of this need rather than toward working on the learning task.

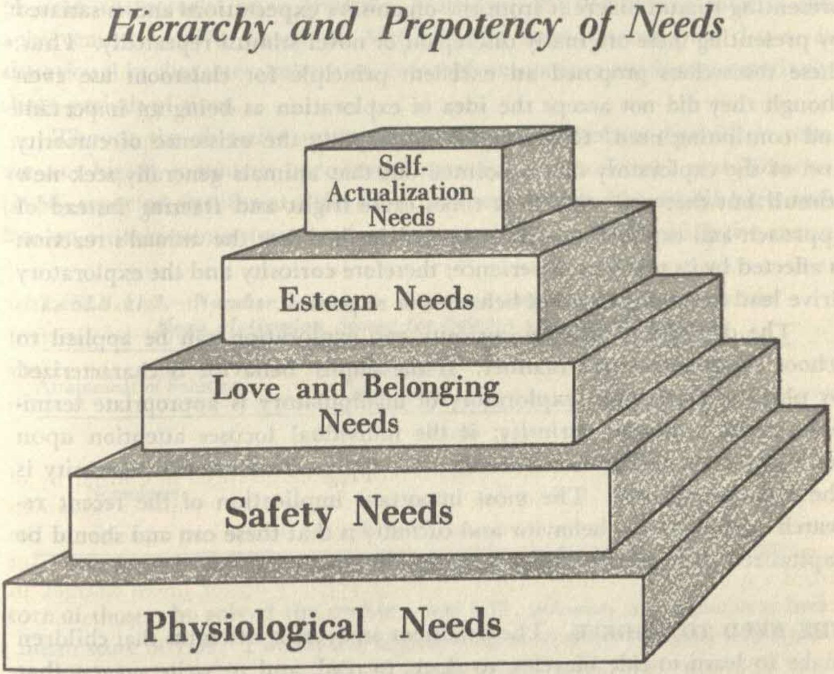


FIGURE 11.1.

Other Needs and Self-Sustaining Activities

The need to explore and the need to achieve, sometimes called the achievement motive (abbreviated "n Ach") require special attention. Both have been found useful in discussing motivation in college students (Ringness, Klausmeier, and Singer, 1959). Also, some habits appear self-sustaining; the individual performs the activities without seeming to be motivated by any need gratification or without relating his actions to goal-setting more generally.

THE NEED TO EXPLORE. Early in life children demonstrate exploratory behaviors. When the child can walk, he leaves his room, his house, and the play area to explore the bright objects elsewhere, to find the source of the loud and different sounds, to learn what is on the other side of the street. His hands are used to feel and manipulate new materials, and he uses his mouth to experiment with new foods and the making of new sounds. Lower-form animals and children demonstrate manipulatory behavior even though their biological and safety needs are well satisfied.

Behavior described by such terms as "exploration," "manipulation," and "curiosity" are very much alike and belong to a general class of behavior, attention, according to Dember and Earl (1957). Attention is aroused by presenting stimuli different from the organism's expectations and is satiated by presenting these originally discrepant or novel stimuli repeatedly. Thus, these researchers proposed an excellent principle for classroom use even though they did not accept the idea of exploration as being an important and continuing need. Glanzer (1958), accepting the existence of curiosity and of the exploratory drive, pointed out that animals generally seek new stimuli but that new stimuli at times cause fright and freezing instead of approach and exploration. He proposed further that the animal's reaction is affected by its previous experience; therefore curiosity and the exploratory drive lead to varying forms of behavior or responses.

The distinction between curiosity and exploration can be applied to school situations in this manner. If the pupils' behavior is characterized by physical movements, exploratory or manipulatory is appropriate terminology and subsumes curiosity; if the individual focuses attention upon some object or phenomena without overt approach movements, curiosity is the appropriate term. The most important implication of the recent research on exploratory behavior and curiosity is that these can and should be capitalized upon in the school learning situations.

THE NEED TO ACHIEVE. The persistent and varied attempts that children make to learn to ride bicycles, to skate, to read, and to write suggest that there is strong need to secure mastery over things and ideas. So long as the person feels uncomfortable with himself in relation to a learning task, he expends considerable effort in such activities as studying, practicing, getting new information which lead to mastery. The need to achieve mastery over things and ideas is so prevalent in American society that it can be used effectively in classroom motivation. Achieving mastery over people is also sufficiently strong in some children that it often requires substitution of other goals.

Teachers estimate the need to achieve by observing pupil's activities in the classroom. However, recent attempts have been made by McClelland, *et al.* (1953) and French (1956) to measure its strength or intensity as a general characteristic in people. Birney (1959) investigated the reliability of McClelland's test. Table 11.1 shows a positive correlation over a relatively short

TABLE 11.1. Coefficients of Equivalence Stability for N *Achievement*

	February, 1957 (N = 40)	April, 1957 (N = 26)	August, 1955 (N = 46)
October, 1956 (N = 46)	+.29	+.56[a]	+.15
February, 1957		+.20	+.40[a]
April, 1957			+.03

[a] $p < .05$.

Source: *Birney, 1959, p. 267.*

period of time between two successive sets of scores; but with longer passage of time, the correlation is generally quite low. Birney concluded that the achievement motive, based on McClelland's measurement procedures, is situational in character; otherwise, it would not vary so much over relatively short periods of time.

Though the objective scores derived from achievement-motivation tests are not highly consistent over longer periods of time, French and Thomas (1958) reported significant differences between airmen who scored high and low on an achievement-motivation test. As shown in Table 11.2, the mean score of those who solved the problem was 9.28, whereas the nonsolvers had a mean score of 7.34. Twenty-five high-scorers solved the problem and fourteen did not; twenty-two low-scorers solved the problem and thirty-one did not. This result is similar to other reports of differences in achievement between students who score high or low on various projective and other tests of achievement motivation.

TABLE 11.2. Number Solving in High and Low Motivation Groups and Mean Motivation Scores for Solvers and Nonsolvers

Attainment of Solution	Achievement Motivation		Motivation Scores	
	High	Low	Mean	SD
Solvers	25	14	9.28	3.95
Nonsolvers	22	31	7.34	3.62
	$\chi^2 = 4.45$		$t = 2.31$	
	$p = .05$		$p = .03$	

Source: *French and Thomas, 1958, p. 46.*

The research cited above was entirely with older persons, mostly college students and other adults. Little has been done to measure achievement motivation directly in school-age children. Since motivation scores vary over short time periods in supposedly more stable adults, direct observation of pupil behaviors in the classroom might serve better than tests to ascertain the strength and direction of the achievement motive in individual pupils. However, the achievement motive is quite clearly established as an important determiner of the direction and intensity of an individual's behavior. Further, differences in strength of need to achieve is reflected in varying levels of achievement.

SELF-SUSTAINING ACTIVITIES. An individual acquires many relatively stable behavior patterns which appear not to be initiated by any need deprivation or gratification (or, at least, the level of gratification is so low that the individual is not aware of it). Such routine activities as brushing the teeth, shaving, and reading the newspaper appear to both an outward observer and the individual himself as self-sustaining—no observed or felt need initiates the particular behavior.

GOALS AND GOAL-SETTING

The goal is the end result which the individual seeks and goal-setting implies conscious awareness of what is being sought. Needs, as discussed in the preceding section, are closely related to goals and this relationship will become more apparent in the discussion of: (1) remote, intermediate, and immediate goals; (2) setting and attaining immediate goals; (3) factors affecting goal-setting; and (4) overcoming the effects of failure.

Remote, Intermediate, and Immediate Goals

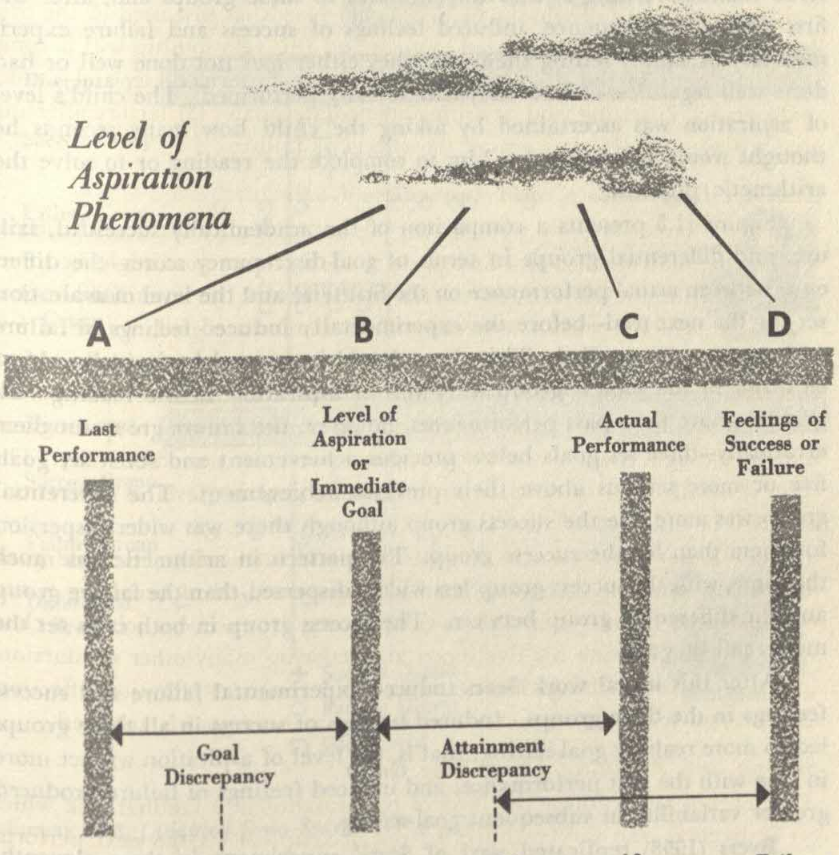
Remote, intermediate, and immediate goals are related to the developmental level of the individual. For a first-grade child, a remote goal might be something he wishes to achieve four weeks in the future, an intermediate goal would be achieved within a week, and an immediate goal, within a few minutes or an hour. The college freshman sets a remote goal of becoming a successful teacher four years hence, an intermediate goal of completing the required courses in the freshman year, and an immediate goal of reading and understanding a chapter in a book within a two-hour period of study. The term generally used to describe an immediate goal is "level of aspiration" and will be discussed further later.

One other characteristic of goals requires clarification. Remote goals are usually multiple. The freshman who sets the goal of becoming a successful teacher perceives in this not only doing an excellent job in a classroom but also earning his livelihood and securing many other satisfactions in the process of teaching. His needs for achievement, exploration, affection, esteem, and self-actualization are met if the remote goal is achieved.

Setting and Attaining Immediate Goals

The level of aspiration is the level of performance in a familiar task which an individual tries for or thinks he can accomplish on the next performance. Figure 11.2 shows the process of goal-setting and some of the terminology connected with level of aspiration. Imagine that Bill, Mary, George, and Susan are in a typing class. Their last performances, point A, are shown as 20, 30, 35, and 40 words per minute on a 5-minute test. The teacher asks them to indicate how many words per minute they expect to type in a 5-minute test two days later. As shown, their levels of aspiration or immediate goals are set as follows: Bill—40, Mary—33, George—33, and

Susan—43. The difference between the last performance and the level of aspiration now set, goal discrepancy, can be positive or negative. Notice that Bill shows a positive goal discrepancy of 20 and George a negative goal discrepancy of 2. These students continue their class work and two days later take another 5-minute test. As shown in Figure 11.2, Bill achieves a speed of 18, Mary—30, George—38, and Susan—45. The attainment discrepancy is again both negative or positive. Bill shows a negative attainment discrepancy of 22 and Mary of 3; George and Susan show positive attainment discrepancies of 5 and 2. If these students were all ego-involved—actually


Level of Aspiration Phenomena
A
B
C
D
Last Performance
Level of Aspiration or Immediate Goal
Actual Performance
Feelings of Success or Failure
Goal Discrepancy
Attainment Discrepancy

Bill	20	*+20*	40	*−22*	18	***Failure***
Mary	30	*+ 3*	33	*− 3*	30	***Failure***
George	35	*− 2*	33	*+ 5*	38	***Success***
Susan	40	*+ 3*	43	*+ 2*	45	***Success***

FIGURE 11.2.

had set the goals and tried to attain them—Bill and Mary would have experienced failure whereas George and Susan would have experienced success feelings.

Sears (1940) made an excellent study of level of aspiration in fourth-, fifth-, and sixth-grade children. She arranged them into three experimental groups as based upon previous school experience. The success group was composed of children who had shown subjective and objective evidence of success in all academic school subjects, including reading and arithmetic; the failure group had the opposite experience; and the differential group had experienced success in reading and failure in arithmetic. She administered familiar reading and arithmetic tasks to these groups and, after the first goal-setting sequence, induced feelings of success and failure experimentally by simply telling them that they either had not done well or had done well regardless of how they had actually performed. The child's level of aspiration was ascertained by asking the child how many seconds he thought would be needed for him to complete the reading or to solve the arithmetic problem.

Figure 11.3 presents a comparison of the academically successful, failure, and differential groups in terms of goal-discrepancy scores—the difference between actual performance on the first trial and the level of aspiration set for the next trial—before the experimentally induced feelings of failure and success were applied. This chart should be viewed horizontally. Most children in the success group set levels of aspiration in the reading task slightly above their past performances; however, the failure group set them erratically—three set goals below previous achievement and seven set goals five or more seconds above their previous achievement. The differential group was more like the success group although there was wider dispersion for them than for the success group. The pattern in arithmetic was much the same, with the success group less widely dispersed than the failure group and the differential group between. The success group in both tasks set the most realistic goals.

After this initial work Sears induced experimental failure and success feelings in the three groups. Induced feelings of success in all three groups led to more realistic goal-setting; that is, the level of aspiration was set more in line with the past performance; and induced feelings of failure produced greater variability in subsequent goal-setting.

Byers (1958) replicated part of Sears' experiment in three eleventh-grade classes in United States history, but did not attempt to induce feelings of success or failure experimentally. He divided the students into two groups, one which had experienced previous academic success and another which had experienced lack of success as indicated by grade-point average. These students then set six consecutive goals, corresponding to reporting periods, throughout an academic year. He found that the students with a record of previous academic success achieved higher and set goals more realistically and usually above previous performance, whereas those with previous failures achieved lower and set goals less realistically—sometimes above previous performance and sometimes below. The actual experience of success and failure in attaining goals had similar effects on later goal-setting, as Sears had found with induced feelings of failure and success. There was a tendency, however, for more of Byers' students who had experienced success in reaching one goal to set the next goal lower than was the case in Sears' study.

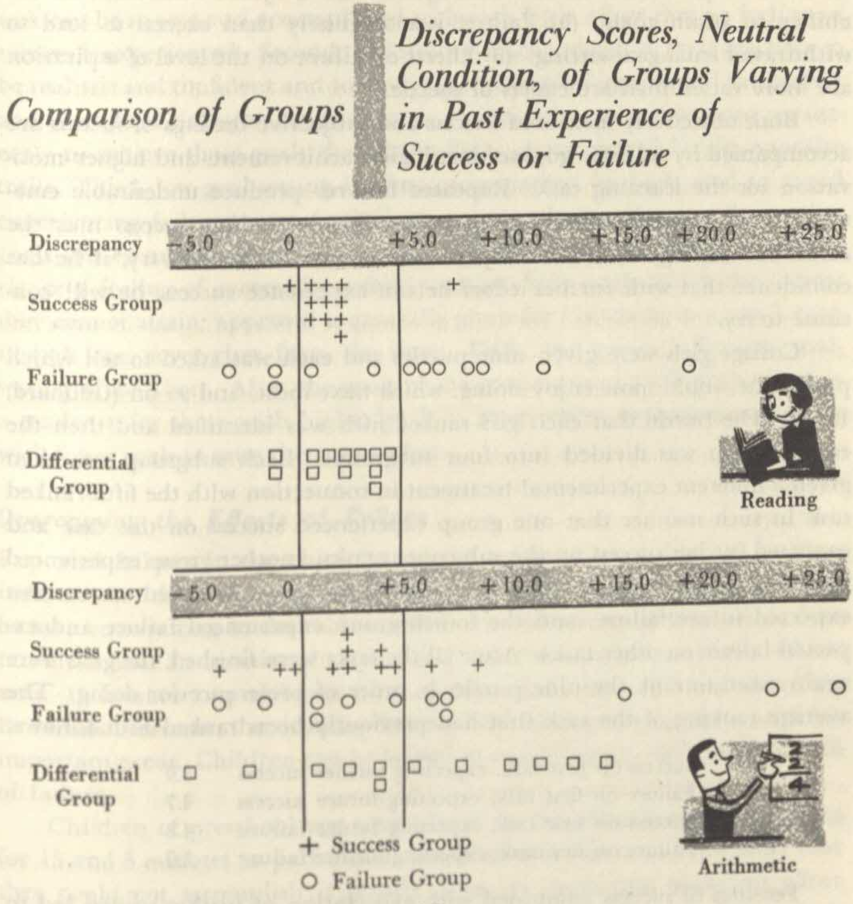


FIGURE 11.3. *(Adapted from Sears, 1940, p. 371.)*

More informal evidence about level of aspiration was secured by Child and Whiting (1949), using college students and realistic situations.

The conclusions of this study, similar to those of Sears and Byers, are summarized in five statements: (1) Success generally leads to raising the level of aspiration; failure, to a lowering. (2) The stronger the success, the greater is the probability of a rise in the level of aspiration; the stronger the failure, the greater is the probability of a lowering. (3) Shifts in the level of aspiration are in part a function of changes in the subject's confidence in his ability to attain goals. (4) Failure is more likely than success to lead to withdrawal from goal-setting. (5) Effects of failure on the level of aspiration are more varied than are effects of success.

Both objectively measured success and subjective feelings of success are accompanied by realistic goal-setting, higher achievement, and higher motivation for the learning task. Repeated failures produce undesirable emotional concomitants, which is not to say that immediate success must be achieved. Though a student experiences failure on his first try, if he has confidence that with further effort he can experience success, he will continue to try.

College girls were given nine puzzles and each was asked to tell which puzzle she would most enjoy doing, which next most, and so on (Gebhard, 1948). The puzzle that each girl ranked fifth was identified and then the entire group was divided into four subgroups. Each subgroup was then given a different experimental treatment in connection with the fifth-ranked task in such manner that one group experienced success on this task and expected further success on the subsequent tasks, another group experienced failure but expected future success, a third group experienced success but expected future failure, and the fourth group experienced failure and expected failure on other tasks. After all the tasks were finished, the girls were again asked to rank the nine puzzles in order of preference for doing. The average ranking of the task that had previously been ranked fifth follows:

Success on first task, expecting further success	3.9
Failure on first task, expecting future success	4.7
Success on first task, expecting future failure	4.8
Failure on first task, expecting further failure	5.9

Feelings of success combined with expectation of further success led to higher preference for the particular puzzle, and failure with expectation of further failure led to lowest preference for the particular puzzle. Though present success and expectation of future success resulted in greater liking for continuing an activity, some individuals who failed and expected further failure persisted in desiring to continue with the activity.

Factors Affecting Goal-Setting

Present success and expectation of further success have a desirable effect upon motivation, achievement, and subsequent goal-setting; repeated failure has an undesirable effect upon motivation, achievement, and goal-setting.

Other factors affecting goal-setting include the nature of the task and various personality variables not directly associated with the task. Holmes (1959) analyzed fifty-nine studies dealing with level of aspiration that had been reported from 1930 through 1958. Several of her conclusions have important implications for educational practice. First, a task can be so difficult that no student can realistically set a goal or hope to achieve success on it; also, a task can be so easy and accomplished with such little effort that no feeling of success is experienced. Second, children who are judged by their teachers to be realistic and confident and to have comfortable feelings toward themselves and the school situation set goals more realistically and strive more persistently to achieve those goals than do students characterized by the opposite traits. Third, low goal-setting is often accompanied by high need to avoid experiencing failure; some individuals protect their self-esteem by setting goals low enough to be achieved easily. Fourth, insecure individuals experience a feeling of success by publicly setting high goals which they know they cannot attain; approval is generally given for "hitching to a star," even though one never rises from the smog. Fifth, the group influences goal-setting of members. After the goals of the entire group are known, there is a tendency for those with higher goals to lower them somewhat and those with lower goals to raise them somewhat.

Overcoming the Effects of Failure

Repeated failures in the objective form of grades or in subjective feelings indicate that the student is not learning as efficiently as he might and that he may be acquiring undesirable attitudes toward self and school. This does not mean that an occasional pupil should not be failed by objective standards. If, however, a pupil fails for no reason of his own or for reasons that he cannot overcome, the situation has not been arranged to meet some of his important needs. Children can be helped to overcome the undesirable effects of failure.

Children of preschool age were placed in two experimental situations for 15 and 8 minutes to perform an attractive task, but one so difficult that they could not accomplish it readily, if at all, with best persistent effort (Keister and Updegraff, 1937). The experiment was arranged to induce feelings of failure. The responses of the children in the two situations showed considerable variation and fifteen of them demonstrated exceedingly immature behavior. In the second part of the experiment, twelve of those of immature behavior participated in a training program designed to ascertain the extent and the means by which the undesirable effects of failure could be overcome. In this experimental program four similar but different attractive tasks were arranged according to level of difficulty, from quite easy to difficult but solvable with persistent effort. During the re-education period the experimenter started with the easiest task, helped each child at times, encouraged him to continue at times, and arranged the situation so that the child could see his progress and was aware of his success with the first easier tasks. Figure 11.4 shows the responses of the group on a task similar to the original difficult tasks before and after the experimental training. Marked improvement occurred in three behaviors: attempting to solve the problem alone, interest in the task, and no crying. The training did not have much effect on the children's asking for help; however, on all other behaviors the small differences show that the training produced more desirable responses.

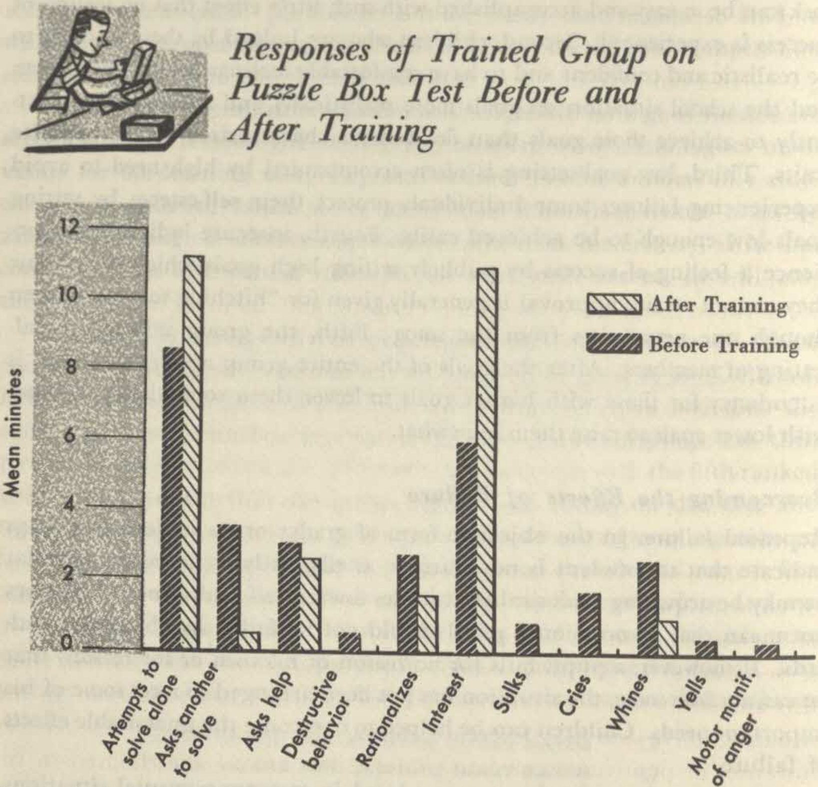


FIGURE 11.4. *(Adapted from Keister and Updegraff, 1937, p. 246.)*

Whether giving failing students individual help and easier tasks on which they can succeed will prove effective in the elementary and secondary schools cannot be answered directly from the above experiment. However, the previous studies on level of aspiration with school-age and college students show that building confidence in the individual, arranging situations so that he experiences success, and deliberately informing him that his progress is somewhat better than it actually is lead to persistent trying to achieve goals.

COOPERATION AND COMPETITION

We are somewhat schizophrenic in that we encourage pupils as well as adults to cooperate in a variety of activities in the home, the school, and the neighborhood and simultaneously encourage competition for rewards of many types from early infancy throughout adult life.

The outcomes of training in cooperation and competition are not clear and are dependent upon the age of the individuals, the forms of cooperation and competition, and the areas in which the competition and cooperation are carried out. We do know that the values from competition and cooperation are somewhat different. In competing with others one wishes to win or to do better for personal gain or prestige. In cooperative activities one wishes to improve himself and to make a significant contribution to the group. If the competition is friendly and so organized that every student has opportunity at some time to win, motivation, achievement, and interpersonal relations may be excellent; however, in poorly managed competition hostility between members of the group develops, and, in younger children, outward aggression occurs. In cooperative activities there is no reason for hostility or aggression to develop; on the contrary, the group members are encouraged to help one another. We turn now to some outcomes of cooperation and competition in people of varying ages and under varying arrangements.

Second-grade pupils were asked to paint two murals during noon hour. Before painting the first one, they were told that, if every one painted well and if the mural was a good one, every one would receive a prize—a package of colorful stickers. Before painting the second mural, they were told that only the best painters would receive prizes. The children were then observed during the painting sessions and in subsequent play activities; check lists and stenographic recordings were made during the observation. In this situation there was no difference during the painting sessions between instances of positive and negative interactions among the children in the two situations; the effects of cooperation and competition were the same (Stendler, Damrin, and Haines, 1951).

Within two seventh-grade classes, students tried to better their own previous performances (individual competition) and in two other classes the students competed against one another for three days (Gross, 1946). On Monday and again on Friday a self-scoring test was given to the students to determine whether or not the pupils changed answers, i.e., cheated, when given the opportunity to do so. The individual competition consisted of having each child keep a record of his progress on Tuesday, Wednesday, and Thursday. The group competition consisted of telling children how their scores compared with the scores of pupils in the other class. Wide variation in the number of children who cheated was found under both competitive arrangements, but no difference was observed in the amount of cheating between the two forms of motivation—individual and group. Two-thirds of the children who cheated did so on only one of the days, Monday or Friday. Children of higher intelligence and those of higher achievement cheated less frequently than those of lower intelligence and lower achievement. Achievement was the same under the two forms of competition, although the fact that all pupils had knowledge of results each day may have been a stronger motivating force than either form of competition; also, the entire learning time was only a brief portion of the school day for one week.

Four groups of high cohesiveness and four groups of low cohesiveness were drawn from a number of fourth-grade classes by Phillips and D'Amico (1956). Two of the high-cohesive and two of the low-cohesive groups worked under cooperative conditions while the other four groups worked under competitive conditions. In the cooperative arrangement the members of the group shared equally in a reward, whereas in the competitive group they shared in accordance with their relative contributions in responding to a modification of the game of "Twenty Questions." Under cooperative conditions the groups which were already cohesive increased in their cohesiveness, whereas under competition there was no change in cohesiveness. As the experiment turned out, the children under the competitive arrangement shared about equally in the rewards. This led to a final conclusion that, if the results of competition lead to a fairly uniform distribution of rewards in the group, the effects of competition may be similar to that of cooperation; however, if only one or two members receive the rewards, competition will likely lead to a decrease in group cohesiveness.

An interesting task was arranged for college students in which there was no need to use an external incentive to keep the students working (Shaw, 1958). The students worked under three experimental conditions: one in which the subject perceived himself to be in a cooperative situation, one in which he saw himself as competing with another, and the third in which he worked alone. Two relatively simple tasks that could be performed in a few minutes were used. On both of these tasks the cooperative situation yielded most efficient learning, the individual situation next, and the competitive situation least. Other information from the three groups obtained by means of questionnaires, ratings, and interviews showed that the students in the competitive situation rated their motivation highest, rated their enjoyment of the task highest, and thought they expended the most energy. For some unexplained reason the higher motivation with possible threat to self-esteem in the competitive situation led to some disruption of response and therefore to less effective learning. The students in the cooperative situation appeared to be relaxed and stated they were, feeling that the other person would either perform well or share the blame for the poor performance.

In none of the preceding studies did competition yield more efficient learning than cooperation. Since cooperative activities also reduce the threat of failure and frustration for pupils of lower abilities, the school should seriously consider reducing competition among pupils in regular classroom learning situations. This is in line also with the previously discussed ideas about individual goal-setting.

THE NATURE OF INTERESTS

The usual means of ascertaining an individual's interests in activities is to observe his behavior or to ask him more directly to state his preference for a number of activities. Vocational interests have been studied rather extensively, starting in high school at about the ninth or tenth grade, and in adults. After many years of comprehensive study, Strong (1958) suggested that interests have five characteristics:

> First, they are acquired in the sense that feeling becomes associated with the activity. We are not referring to the learning of an activity itself, such as writing one's name, which usually requires many repetitions. We are referring to the associating of feeling with an activity. . . .
>
> Second, interests are persistent. Sometimes disliking is replaced by liking and vice versa; many start out disliking olives and acquire a taste, a pleasant feeling for them. But, all in all, interests are surprisingly permanent.
>
> A third characteristic of interests is intensity. One can not only immediately indicate whether he likes or dislikes an activity, but one can also immediately indicate his relative preferences for different activities.
>
> The fourth and fifth characteristics are acceptance-rejection and readiness to act. . . . The associated value, or feeling quality, determines whether the activity will be accepted or rejected, whether the organism will go toward or away from, whether it will continue the status quo or discontinue it. It must also be noted that many activities develop in time so as to bring sufficient pleasure to be employed for their own sake. So we smoke, chew gum, play bridge, or golf for the fun of it [Strong, 1958, pp. 452–453].

The persistence of interests noted above is based on tested preference for activities in persons in the age group twenty-five to fifty-five. Using an interview technique in which seventy-five male and seventy-five female teachers and forty-three male factory workers recalled their first interests in occupations, Norton (1953) obtained the results that are shown in Figure 11.5. At the time of the interview, these people were between twenty-eight and forty years of age, with a mean age of thirty-four. Figure 11.5 shows that the development of interests in jobs was different in women than in men teachers and also that the interests of men who became teachers differed markedly from those of men who became factory laborers. Fifty percent of the women recalled a vocational preference at about age nine, 50 percent of the men teachers did at about age eleven, and 50 percent of the factory workers did at about fourteen. It is interesting to note that 100 percent of the teachers reported a definite vocational interest at age twenty-one, but that factory workers in considerable numbers reported no vocational interest at any point in their lives. The vocational interests which were recalled as early as ages three and four were simply interests in some sort of work activity. Figure 11.5 is not to be interpreted as the age at which these groups showed interest in their eventual careers, nor does it indicate that the same vocational interest persisted throughout the entire age span.

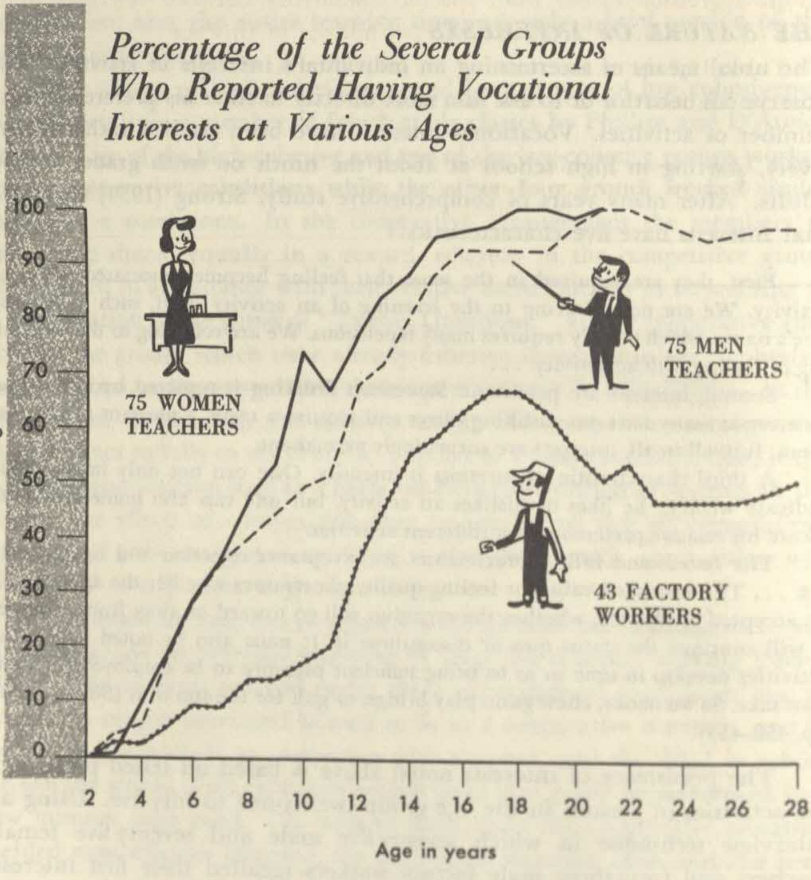


FIGURE 11.5. *(Adapted from Norton, 1953, p. 249.)*

An exciting study to ascertain interests of children from the first grade on through high school is now under way and the results are available for the children as first- and fourth-graders (Tyler, 1951, 1955). First-grade children were found to have four main kinds of interests: active play outdoors, playing with toys indoors, paper-and-pencil activities, and helping adults with work. Marked sex differences were found in the interests of boys and girls. The sex differences became even more pronounced in fourth-grade children. The boys' interests were characterized as rejecting inappropriate activities, things associated with being a sissy, and girls' work. Girls rejected physical activities, aggression, and all sorts of activities they considered inappropriate for girls. Tyler strongly believes that interest patterns result from the development of dislike of many activities by both boys and girls who originally had a liking toward the same activities. Further, it is the broad interest in sexually determined activities, in work, and in aggression rather than specific similarities between activities that seems to determine interest patterns in children of this age.

Table 11.3 shows the items of the total interest test on which the differences among fourth-grade boys was greatest. It is surprising to see the large

TABLE 11.3. Items Showing Greatest Individual Differences in Responses (Boys)
($N = 96$. Total sum of tabulations varies because of omissions and double responses.)

		Like	Indifferent	Dislike	Undecided
Part 1.	Reading				
	Love stories	23	15	48	8
	To read aloud	37	18	35	3
Part 2.	Movies				
	Love stories	22	17	45	7
	Movies about rich people	35	21	32	6
	Sad movies	30	20	38	5
Part 3.	Radio				
	Classical music	30	24	35	6
	To have the radio on while reading	34	21	36	3
Part 4.	Games and toys				
	Blocks	29	22	41	3
	Dancing	37	19	35	8
	Hopscotch	27	22	33	10
	Jacks	30	17	36	10
	Jumping rope	22	21	45	8
	Playing doctor or nurse	32	17	40	5
	Playing school	29	19	40	5
Part 9.	Occupations				
	Barber	29	20	38	7
	Bookkeeper	39	19	32	4
	Dentist	32	18	35	8
	Orchestra leader	29	24	30	7
Part 10A.	Activities				
	Be in a fight	30	17	43	1
	Clean house	33	19	38	2
	Sew	28	15	46	3
	Sing in choir or glee club	37	12	33	10
	Study	42	18	28	3
	Wash dishes	31	16	42	3
Part 10B.	School play				
	Make the costumes	34	17	38	3
	Write the play	46	8	34	4

SOURCE: *Tyler, 1955, p. 86.*

difference in the number of boys who showed like and dislike for various activities such as reading aloud, seeing sad movies, the occupation of orchestra leader, being in a fight, studying, washing dishes, and writing the school play. Note that these are activities in which there was most difference among the fourth-grade boys. On many other activities there was much higher agreement.

Though we know that vocational interests become relatively stable somewhere around age twenty and that differences among pupils in school activities are far-ranging, we are less certain as to the process by which interests are originally acquired. Tyler is testing the theory that the learned dislike of various activities is most important in eventually choosing other liked activities. Her theory that dislike of activities is learned is crucial if fully supported in school situations, for it means that the child probably acquires disinterest or dislike for certain learning activities as shown in Table 11.3 after he starts school.

PRINCIPLES OF MOTIVATION

As was stated earlier, some pupils come to school and want to learn everything the school and teacher desire. With these pupils, the principal motivational task is to find sufficient and appropriate learning activities for them. Many pupils, however, do not want to learn what the school and teacher desire, or they do not want to learn it in the particular manner in which the learning tasks are set forth. All the principles which follow are applicable to the second group and, to a lesser extent, to the first group. Since the teacher cannot deprive children for a sustained period of time of biological need satisfactions and therefore cannot induce a drive state with techniques employed in animal laboratories, other principles must be implemented:

1. Focus pupil attention toward desired learning outcomes.
2. Utilize curiosity and encourage its development.
3. Use existing interests and develop others.
4. Provide concrete and symbolic incentives if necessary.
5. Arrange learning tasks appropriate to the abilities of the learner.
6. Provide for realistic goal-setting.
7. Aid the learners in making and evaluating progress toward goals.
8. Recognize that too high tension produces disorganization and inefficiency.

1. Focus Pupil Attention Toward Desired Learning Outcomes

The use of a variety of materials facilitates the focusing of pupil attention toward desired learning outcomes. Here is how a fourth-grade teacher focused attention on the study of "Cold Lands" at the beginning of a unit in social studies. The pupils arrived at school the first day after the Christmas holidays on a cold morning:

> After two weeks vacation thirty-two children, anxious to get in from the cold, hurried to Room 120. The thermometer registered 55 degrees in the corner of the room with a north exposure. This was probably the first time the majority of these children realized quite fully the meaning of the word, *cold*.
>
> With stormcoats and snowsuits on, the children examined the totem pole, the walrus tooth, actual photographs of Lapps with reindeer herds, laughing Eskimos in Baffin Island, Aleuts ice-fishing, and numerous pictures displayed on bulletin boards. After spending a few minutes looking at these various things, some of the children started examining library books that had been placed conspicuously on tables. One or two others began to find the Cold Lands on globes and maps.
>
> The environment of the room, mingled with the cold feeling, may have prompted Barbara to remark that, "We were like Eskimos this morning, all bundled up to keep warm."

This use of instructional materials demonstrates how pupil attention can be focused originally to the desired learning outcome.

An eighth-grade general science class began a unit on electrical current, the second unit on electricity, with these words, and a demonstration from the teacher:

> I have a large coil which, as you can see, is insulated wire wound together. I am going to connect the two ends of the coil to this current-measuring instrument called a galvanometer. Here is a friend we have already studied, a bar magnet. Watch what happens to the needle of the galvanometer when I push the North pole of the magnet inside the coil of wire (needle moves to the left). Now watch when I pull the magnet out this way (needle moves to the right). Now I am going to go through the same operations once more. Tell me. why did the galvanometer react the way it did?

The above illustrations show that pupil attention can be focused toward desired learning outcomes through use of materials and activities that involves a number of sensory perceptions. In the fourth-grade class, seeing, hearing, and feeling were all involved. In the science class, seeing, hearing, and listening were involved. In getting a classroom group to focus attention toward the desired learning outcomes, it is essential to appeal to more than one sense, inasmuch as the usual class has within it some pupils who seem to respond better to visual material than they do to spoken words. The teacher takes a positive role in order to make certain that the necessary materials are arranged and available; in addition, he decides whether or not, once their attention has been generally directed toward a learning outcome, the pupils will begin studying from books directly or will engage with the teacher in planning activities.

In some situations it is not necessary to do any more than to let the pupils know, by oral or written suggestions, what is expected. In certain skill classes, also, a self-activating routine may become quickly established whereby pupils come in even before the bell rings and start to work without the teacher's giving any specific instruction. Further, when projects or activities are started but not finished on one day, the tendency is for the pupils to come back and start where they have left off.

2. *Utilize Curiosity and Encourage Its Development*

As discussed in earlier chapters, human beings are curious about objects and phenomena in the environment. Curiosity is generally expressed toward new and novel objects, ideas, and events rather than toward familiar ones, and the arousal of curiosity is not dependent on any form of reward or punishment nor attached to any specific drive situation, such as hunger or thirst. Also, after an object, idea, or material is no longer novel it loses its curiosity value. This suggests that novel ideas and material are used purposefully to arouse curiosity and that other activities or goal-setting connected with the unit of work is designed to capitalize upon aroused curiosity.

It is possible that some activities will so arouse curiosity that the individual will persist in them and, in the process, will learn efficiently. Instructors in science, psychology, and other classes often introduce a puzzle or a game of some sort in order to clarify a major idea being discussed. Even college students become so absorbed in completing the puzzle that, if permitted, they spend the entire class period trying to work it out. Unless brought back by the instructor, they completely miss the idea that the puzzle supposedly illustrates. Much as attention-focusing devices are needed to direct and energize behavior toward learning activities not inherently attractive for one or more students in the group, so also curiosity-arousing procedures are used. The need to explore is quite pervasive and can be capitalized upon daily. The objective is to encourage students to seek the novel and fascinating in the daily learning activities. To the extent that school learning activities do not satisfy this need, gratifications outside the school may be sought. Further, if the individual is thwarted or more directly punished repeatedly for demonstrating curiosity, he may eventually acquire substitute goals or suppress his curiosity.

3. *Utilize Existing Interests and Develop Others*

The simplest way to find out about students' interests is to ask them which of several classroom activities they most prefer. Even though they might not be highly interested in any, giving them the choice itself may encourage interest. And when students feel that subsequent instructional arrangements will in part be used upon their stated interests, they express themselves freely and reliably.

Some teachers have pupils give a short talk or write a brief statement as to the most interesting activity they have engaged in during recent weeks. In art classes the pupils are sometimes given the opportunity to do whatever art work they choose with whatever materials they choose as a means of ascertaining present interests. And in elementary, high school, and college classes expressed interests are frequently used as a basis for dividing classes into smaller groups. When five or more different activities are to be undertaken, the entire class is invited to express interest in the activities, and then the subgroups are arranged according to interests expressed. The idea underlying interest grouping is that motivation is higher because the students are working on activities which attract and hold their attention.

One hundred junior high school pupils were given two different novels with the vocabulary graded to be equally difficult in each novel (Bernstein, 1954). Subsequently, the extent of interest in the two novels was determined, and objective and essay type questions were administered to appraise achievement. High interest was associated with higher scores in reading comprehension; also, there was more identification of the students with the characters and situation in the novel in which the interest was highest. In this situation interest and achievement were positively related.

Edwards and Wilson (1958) found high school boys more interested in natural science than girls, but the girls showed higher interest in social studies, people, and social esteem. The girls received higher total academic grades—mainly because they received higher grades than boys in social studies and English. The boys, though showing higher interest in science, did not get higher grades, even in science. Recognizing that grades may not be an accurate indication of achievement, the authors conclude that when colleges and universities select students on the basis of academic grades, they place the students with high interest in science at a disadvantage. When achievement is based on standardized tests, boys do score higher than girls as a group in science; and the large majority of scholarship winners in science are boys.

Simply because a boy is interested in science and not in working arithmetic problems does not mean that he should be excused indefinitely from arithmetic instruction. But if there is already interest in playing football or swimming, the teacher may be able to utilize this interest by helping the child see the relationship between arithmetic and such things as measuring his own or others' performances. Similarly, if there is little or no interest in silent reading but high interest in caring for a dog, the teacher can use the interest in dogs to encourage interest in reading by providing reading material about dogs. As pointed out previously, activities which are perceived as satisfying or rewarding acquire interest value. If a child does not already have interest in some activity, helping him see that engaging in the activity is satisfying may lead to a relatively stable interest.

✓ 4. *Provide Concrete and Symbolic Incentives If Necessary*

Material and symbolic rewards are sought by adults as well as children and can serve the purpose of getting pupils to perform inherently unpleasant tasks. If the tasks were inherently pleasant or undertaken to achieve important goals, no rewards would be necessary. Punishment also directs or stops behavior. A boy may quit carving initials on his desk to avoid being sent to the principal's office, and a student may quit cheating in order not to receive an *F* for the course.

Working with nine-year-old children of normal intelligence, Abel (1936) used five types or degrees of incentives: no reward, a verbal reward, a penny reward, a *promise* of twenty-five cents upon completing the task, and combinations of these four at various points. The pupils then performed a relatively simple finger type of maze in which the objective was to eliminate errors. The results were of practical significance. First, efficient learning was in the reverse order of the incentive conditions listed. The most effective incentive was the promise of twenty-five cents, even though the children were not given the twenty-five cents. Second, the verbal reward when repeated more than four times lost its effectiveness. Third, the concrete reward —giving a penny—was just as effective when administered during the last fifteen trials as when administered during the entire series of thirty trials. Fourth, and most important, since the promise of twenty-five cents yielded most efficient learning, it was the goal of receiving the twenty-five cents which stimulated the learning, not actually getting the money. The goal created restlessness in the individual and energized his activity, whereas actually receiving the penny or the verbal reward tended to bring about quiescence and lack of further consistent effort.

The size and form of the reward are related to effort and performance as shown above. Reward and punishment also influence what the individual perceives and what he recalls after perception. In college students, both pleasantness and unpleasantness influence perception and retention more than does a neutral condition; however, with a given level of affective intensity, pleasantness has a more desirable influence than unpleasantness on both perception and recall (Sommer, 1957).

If the rewards are kept small and given early in the learning situation to get initial effort started on inherently meaningful learning tasks, it is possible that the learner will associate the pleasantness of receiving the reward with the task. Further, as progress on the task itself is made, the accompanying experience of success and knowledge of progress make continuing rewards unnecessary. And, as shown in the previous chapters dealing with factual and skill learning, reinforcement of correct responses is an essential condition of efficient learning. Most students cannot evaluate their own responses without help and need reinforcements in order to confirm correct or appropriate responses. For example, one group of students received its test papers back corrected and was given 5 minutes to go over the papers. The second group did not have its papers returned. One week later the test was again administered to the students. The results were clear-cut and decisive. Students who were given the opportunity to inspect their papers scored considerably higher, one week later, than did those who did not inspect their papers (Plowman and Stroud, 1942).

A considerable number of students from families that have high interest in education work industriously to achieve desired learning outcomes without any form of external incentive, including grades. Even these highly motivated pupils respond well to occasional praise from the teacher, not only for good achievement, but also for persistent effort. Approval from classmates and others within the school also works well with most students, though some need much less approval from their classmates and teachers than do others.

In summary, the widespread use of concrete and symbolic rewards as motivational devices has many dangers. However, when a teacher cannot get pupils to perform worthwhile learning tasks by other means and they will respond well initially to promised rewards, it is better to use rewards than to use punishments or simply to allow students to sit day after day in the classroom without making any effort to learn.

5. *Arrange Learning Tasks Appropriate to the Abilities of the Learner*

Even after the principles outlined thus far have been practiced, there will not be high and consistent effort directed toward the learning task if it is much too easy or much too difficult. And in most classes that have a considerable range among pupils in ability to perform well, the same learning task cannot be performed equally well by all students in the same length of time. It is impossible, for example, for all fourth-grade pupils to learn equally well the same list of spelling words in a given number of minutes. College students read at different rates and cannot perform the same reading assignment in the same number of minutes or hours. If in a beginning typing class all the pupils are given the same practice materials and instruction and the same amount of time for practice, it is inevitable that after a few months of instruction there will be wide differences among the pupils both in speed of typing and in number of errors. These are simply facts about individual differences that are thoroughly established and perhaps need no further mention inasmuch as they have been discussed in Chapter 3 and other previous chapters. Attention is given to the principle at this point, for if it is not accepted, the next two principles which are crucial to encouraging high and persistent effort in classroom situations and outside the school cannot be put into effect.

6. *Provide for Realistic Goal-Setting*

In order that there be realistic goal-setting the teacher must (1) have a fairly accurate estimate of each student's abilities, (2) have a fairly accurate estimate of the difficulty of the learning activities, (3) encourage varying levels of performance by pupils, (4) permit students of all abilities to experience many successes and occasional feelings of failure in reaching their goals, and

(5) realize that the goal-setting process takes considerably more class time than does giving the same assignments to all students in the class. Realistic goal-setting also requires that each pupil have (1) a fairly reliable estimate of his own abilities in relation to the learning activity, (2) a rough estimate of the difficulty of the learning activity, (3) interest in the learning activity, and (4) some previous success in connection with school learning.

Usually not all of these conditions can be met when the teacher first meets the class or classes at the beginning of a year or semester. Therefore, realistic goal-setting on the first day or during the first week of class is difficult, if not impossible, in many situations. During the first meetings with a class the teacher appropriately gives an overview of the unit or semester activities, directs attention of the pupils to the activities, and arouses curiosity and interest. This helps the pupils estimate the kind and difficulty of activities. Also, before meeting the class the teacher examines cumulative records to get estimates of pupil abilities and arranges to get further appraisal information by observing pupils in various assigned activities early in class meetings. Some testing of vocabulary and skills may be done in early class meetings.

When the teacher has fairly reliable information about the students, whole-class discussion is profitable for arriving at a better understanding of the proposed activities and for encouraging group decision or commitment by the entire group to study and work with enthusiasm and persistence. In most situations dividing a group of twenty to thirty-five pupils into three to five smaller groups in which everyone has better opportunity to discuss possible activities is also appropriate. Finally, there must be individual teacher-pupil conferences with some pupils to help each to set a realistic goal.

How might individual goal-setting proceed in a beginning typewriting class? All students start at the same point—not being able to type—and engage in the usual instruction and demonstration procedures, including distributed practice to increase speed and accuracy until they produce copy at measurable but varying levels of speed and accuracy. Six or more weeks might be needed to reach this point. Once it is reached and the students know their speed and accuracy, each sets the goal he expects to attain one week hence in terms of number of words per minute and number of errors on a timed test. At the end of the week, the timed tests are used to ascertain the extent to which the goal is achieved. After this first experience, the goal set for one week later should be more realistic. In all experimentation on level of aspiration, it is positively affirmed that most students who experience some success in reaching first goals set subsequent goals higher. After several experiences in goal-setting at weekly intervals, more distant goals of two or more weeks in the future are appropriate. Along the way, the teacher, continuously acquiring better estimates of the students' abilities, helps them to raise or lower goals as the situation demands. At the end of the year, we properly anticipate that some students would set and achieve goals in terms of speed twice to three times as high as others.

Many teachers object to the above procedure because of the grading system. What grade should a student receive who has done his best and types at twenty-five words per minute? the one who has done his best and achieved a stable speed of sixty words per minute? Procedures to handle the vexing problem of grading have been discussed fully by Klausmeier (1958). His point of view is that any grading system which prevents teachers from helping pupils learn as well as they might should be carefully examined and changed as necessary. The function of the school is to nurture and improve human abilities and human beings, not to grade and categorize.

7. Aid the Learners in Making and Evaluating Progress Toward Goals

Once a goal has been set, making progress toward that goal and knowing that progress is being made are the most stable and reliable intrinsic motivations known to mankind. Conversely, having set a goal and desiring to reach it without making progress is frustrating. This is the reason for the term "realistic" in Principle 6; the teacher must be available to help the learner make progress or to readjust his goals in line with his abilities.

In a seminar for highly talented high school seniors, each of eighteen pupils in the second week had set goals for the semester; no student had set the same goal. One girl set a goal of writing children's literature. With professional guidance from her teacher, she identified a vast amount of children's literature during the first weeks and started to read and study it and to try out some selections with neighborhood children. Upon becoming better acquainted with the literature, she had to readjust her goal in the early part of the semester to complete more of the reading. After spending much time in these activities, she then started her first writing. In this case the teacher helped her both to readjust her goal and to make progress toward achieving it. In the same seminar another student set the goal of getting a better understanding of "beatnik" literature. After reading several novels, she found difficulty in understanding and evaluating them. The teacher then helped her to develop criteria and to locate critical reviews of the entire "beatnik" movement and of specific novels.

The examples from the typing class and seminar show that whole-class activities and discussions led by the teacher, smaller-group discussion led by the teacher or by designated pupil chairmen, and individual conferences between the teacher and pupil are essential for implementing purposeful and efficient learning based upon goal-setting procedures.

8. Recognize That Too High Tension Produces Disorganization and Inefficiency

Trying to achieve a desired goal is always accompanied with some tension. As shown in Chapter 10, anxiety and stress may become so high that an individual's responses become disorganized; he does not learn efficiently. This is not likely to occur if the situation permits the student to lower his goal; however, persons typically set their goals too high and experience frustration in not attaining them when they also feel that they will lose the approval of peers or other persons whom they admire. Frequently students who set such goals as making all *A*'s experience severe frustration when it becomes apparent that they will receive *C*'s or even *B*'s in one or two courses. The frustration comes not because they feel they are not learning enough or that the learning in itself is not valuable, but because some reward, such as a desired scholarship, will be denied or disapproval from parents or teachers will result.

SUMMARY

Motivation is an integral component of learning and a critical problem in educational settings. Educational psychologists and educators use such terms as *needs, interests,* and *goals* in treating the motivational aspects of teaching–learning processes; in other specialties in psychology *primary drives, secondary drives,* and *incentives* appear frequently.

Unsatisfied needs, with the accompanying tensions, arouse and direct activity toward goals which the individual perceives as satisfying those needs. A classification scheme which incorporates most human needs includes: physiological needs, safety needs, love and belonging needs, esteem needs, self-actualization needs, the need to explore, and the need to achieve.

Goals may be remote, intermediate, or immediate. A variety of organismic and situational factors affect goal-setting and goal-attainment in learning situations, as in life generally. Experiencing success currently and anticipating further success in attaining goals result in higher achievements and better personality integration than do experiencing current failure and anticipating further failure. Cooperative activities offer opportunity for more students to experience success than do competitive activities among individuals where only a few receive the rewards.

Interests are probably acquired in the same way as attitudes. An interest may be persistent, intense, and serve as a set toward acceptance or rejection of an activity. When given a choice, the individual engages in an activity which he perceives as interesting rather than one he dislikes or perceives as uninteresting.

Particularly in situations where students are to acquire learnings for which they perceive little or low need gratification and in which they have little or no interest, the teacher reasonably relies on a variety of motivational procedures.

High motivation can be attained in group situations by: (1) focusing pupil attention toward desired learning outcomes, (2) utilizing curiosity and encouraging its development, (3) using existing interests and developing others, (4) providing concrete and symbolic incentives if necessary, (5) arranging learning tasks appropriate to the abilities of the learner, (6) providing for realistic goal-setting, (7) aiding the learners in making and evaluating progress toward goals, (8) recognizing that too high tension produces disorganization and inefficiency.

QUESTIONS AND ACTIVITIES

1. (a) State two goals you intend to reach this week, two others one year hence, and two others ten years hence.
   (b) What is the relationship between these goals and your needs as you perceive them? Your interests?
2. (a) Critically evaluate the concept of a hierarchy of needs–motives.
   (b) How might this concept be useful in appraising intensity of student motivation for classroom activities?
3. Describe your present needs to achieve and to explore. Are they intense? Already gratified? Connected with which facets of your daily life?
4. Referring to the research of Sears and others, discuss briefly the effects of setting and attaining immediate goals.
5. (a) Classify the five factors affecting goal-setting into two groups: organismic and situational.
   (b) Put the five in the order from highest to lowest to indicate your judgment as to which a teacher can exercise most control over in a classroom setting.
6. Using Figure 11.4, and if necessary referring to the article on which it is based, state your conclusions about overcoming the effects of failure.
7. (a) Summarize the results of the research reported on cooperation and competition.
   (b) Why does research not yield clear-cut and final conclusions about the effects of cooperation and competition in school situations?
8. If feasible, secure and plot the interests of yourself and others of your age as shown in Figure 11.5.
9. (a) Describe a classroom situation, including the number of students, sex, school level, range of general intellectual abilities, and range of achievement levels represented in the group.
   (b) Indicate how you would implement any five of the eight principles of motivation in this situation.
10. (a) Drawing on your own experiences as a student, list the three principles you judge were least frequently applied by your teachers.
    (b) Why were they least frequently applied?

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Chapter 12 *Retention and Transfer*

The teacher, with others, is concerned about the extent to which the learnings pupils acquire during a day, week, or month will be remembered at a subsequent time. He is also concerned about transfer of learning—whether what is learned and remembered will help in meeting new or different situations with greater effectiveness. A main reason for formal education in school is to facilitate learning in situations outside school. The conditions and relationships among original learning, remembering, and transfer of learning are treated in the subsequent discussion of: (1) outcomes which may be retained and transferred; (2) the nature of retention and forgetting; (3) viewpoints about transfer; (4) principles for encouraging retention; (5) principles for facilitating transfer.

OUTCOMES WHICH MAY BE RETAINED AND TRANSFERRED

An outcome may be said to have been acquired when first incorporated into the learner's behavior pattern; for example, when the child demonstrates the correct spelling of a word or the correct solution of a problem, we properly say that at that time he has acquired the particular outcome. If at a later time the individual can correctly spell the same word or solve the problem, we say that he has remembered or retained what he has acquired. And transfer of learning occurs when whatever is learned in one situation is used in a new or different situation.

The simplest form of positive transfer is through stimulus generalization. That is, after an organism has learned to make a certain response to a certain stimulus, other previously ineffective but discriminated stimuli elicit the same response. For example, the infant reaches for the bottle when the mother appears with it; subsequently the father or some other person brings the bottle, and the child responds by reaching. The child gives the same response to a number of different persons bringing the bottle, though each person with the bottle is a somewhat new or different stimulus situation. In school, children learn to read from books; at home somewhat different stimulus situations are presented in magazines, newspapers, and television. The children, however, respond to the new or different stimuli by reading from left to right, up to down, and the like, as they have learned to read books.

The idea that an organism can learn to make any response of which it is capable to any stimuli which it is able to discriminate is central to explanations of acquisition and transfer in the learning theories of Estes (1957), Hull (1952), Skinner (1938), and Spence (1936). In turn, these and other theorists have produced a large amount of experimental information which shows conclusively that for transfer of learning to take place from one situation to another the organism must recognize something similar, but not necessarily identical, in the new situation that was also present in the original learning situation.

As will be described more fully later, transfer can be positive and implement learning in new situations, it can be negative and impede subsequent learning, or it can have no effect or a negligible effect on subsequent learning. But all outcomes of learning treated in Chapters 6-10, as well as interests and motives treated in Chapter 11, can be acquired, retained, and transferred. Attitudes, interests, and motives function more as sets or predeterminers of what will be learned in new situations, whereas facts, skills, concepts, methods of learning, and methods of adjustment transfer more directly to new situations. In the next paragraphs brief attention is given to the last three for illustrating the relation of retention and transfer.

Concepts, based on a relatively larger number of facts, are retained better than the facts themselves and also show greater possibility for transferring to a variety of new situations. This was shown when one hundred seventy-two students were given a pretest, the same test at the end of the semester. and the same test four months later (McDougall, 1958). After four months they remembered the concepts better than the specific information on which the concepts were based. Thus, separate facts do not transfer so readily as concepts, in part because facts are forgotten more rapidly and in part because they are less applicable to a variety of situations.

Methods of learning are indicated by a variety of terms such as *work methods, study methods,* and *work-study skills.* All the terms refer to the process of learning how to learn. Whether the original learning is the running of mazes by lower animals or the solving of problems by human beings, the means or methods of learning are the highly pervasive outcomes that are retained and that transfer to many subsequent situations. Harlow (1949) demonstrated that learning to learn was an important characteristic of apes and younger children and concluded that learning to learn efficiently transforms the human organism from a creature that adapts to a changing environment by trial and error to one that adapts by seeming hypothesis and insight. He further postulated that learning to learn is a more important variable in most learning tasks than is making correct responses in the presence of certain stimuli.

A consistent increase in such work-study skills as map reading, use of references, use of index, use of dictionary, and alphabetization was found from Grades 4 through 8 by Howell (1950). In addition, he also found considerable differences in these skills between children of low intelligence and of high intelligence enrolled in the same classes; all differences favored those of higher intelligence. Among other things, Howell concluded (1) that every school should have a good central library in which to give instruction in work-study skills, (2) that work-study skills should be incorporated into the entire instructional program each day, (3) that slow-learning groups as well as fast-learning groups profit from instruction in work-study skills, and (4) that planned instruction should begin not later than the fourth grade. These learning-to-learn skills have high prospect for transfer, facilitating new learnings in a variety of in- and out-of-school situations.

Methods of adjusting include goal-oriented effort, reinterpretation of self-situation relationships, pursuit of substitute goals, withdrawal, aggression and related reactions, and suppression and related reactions. Though all these methods of adjusting are used to some extent by most individuals, those most fruitful for positive transfer to many situations are goal-oriented effort, reintepretation of self-situation relationships, and pursuit of substitute goals. Heyns (1958) states that many methods of adjustment are learned at a young age and subsequently have a very important impact on one's life. Though it is difficult to ascertain precisely how a particular method of adjustment is originally acquired, it is certain that the acquired methods are applied to new or somewhat different situations—that is, the individual interprets the new situation in such way that he responds to it with a previously learned method of adjustment. Methods of adjusting and methods of learning are two outcomes which require more attention in school than has generally been given to them.

THE NATURE OF RETENTION AND FORGETTING

Suppose that you were to sit back and try to recall everything that had occurred in the third, sixth, or tenth year of your life. Since you cannot recall perfectly, why have you forgotten? Various explanations are given of why some material and experiences are remembered and others are forgotten. We now consider general explanations. type of material and retention, and unique features of memory and forgetting.

General Explanations

One explanation of retention is that when something is learned and used it is remembered, but that when it is not used it is forgotten. This explanation in terms of *disuse* suggests deterioration or decay of the connections in the brain as the basis for forgetting and some sort of strengthening of connections when the response is used.

Interference of present learning with what has been previously learned also leads to forgetting. For example, you read and studied the preceding chapter on motivation and remembered much of it upon completing your study. Now you are into this chapter; it is possible that your study of this chapter interferes with your remembering materials of the preceding chapter.

Reorganization is also a basis of forgetting. Some material or skill is not acquired well and is not used for some time. The individual then has need to use it and, in the process of recall, reorganizes what he had previously acquired into some new patterns which make sense to him now. For example, a child learned to spell "believe" correctly as part of the organized program of spelling instruction. He did not write the word for several weeks but now needs to in a story. His best present version is "beleve"; in the active reorganizing process to meet the present situation an incorrect spelling is accepted.

Another basis of forgetting is *motivated forgetting,* but it is less well established than are disuse, interference, and reorganization. Apparently, as we learn we constantly decide what we will try to remember and what is not worth remembering; part of this deciding not to remember could represent motivated forgetting. Further, most human beings try to forget unpleasant experiences but are not completely successful; others sometimes forget so completely as to experience amnesia—the inability, not associated with known damage to the brain or central nervous system, to recall past experiences. In some cases the individual can recall nothing of his previous experiences; in other cases there is recall of events only up to a certain period of time preceding the amnesia. Since most amnesia victims are helped by various therapeutic processes to recall the experiences they previously could not, it is assumed that they wanted to forget but now no longer do. Amnesia victims usually have experienced exceedingly unpleasant events before the onset of the condition.

In more normal daily affairs there also is some suggestion of motivated forgetting. Some adults forget appointments perceived as involving unpleasant experiences. Also, the boy who is told to see the principal immediately after school may honestly forget that he was to do so, even though he remembers that his gang is to meet a week hence for a football game. Though the bases of motivated forgetting are not fully understood, the teacher or parents should not immediately conclude that a child is deliberately lying when he states that he forgot an appointment or forgot to carry out some activity he perceived as being highly unpleasant. We do not treat the adult amnesia victim as a deliberate liar and should not so treat the child.

Type of Material and Retention

The relationship between type of material learned and retention has been shown in many studies. Figure 12.1 (Strong, 1913) shows that unrelated material committed to memory by rote procedures is forgotten very rapidly, with more than 70 percent loss at the end of one day and 80 percent loss at the end of the second day. This curve is typical of those in many experiments in which *nonsense material* is committed to memory by rote, and the learning stops when the subject reaches a criterion of one perfect recitation.

Table 12.1 shows the percent of correct answers to examination items

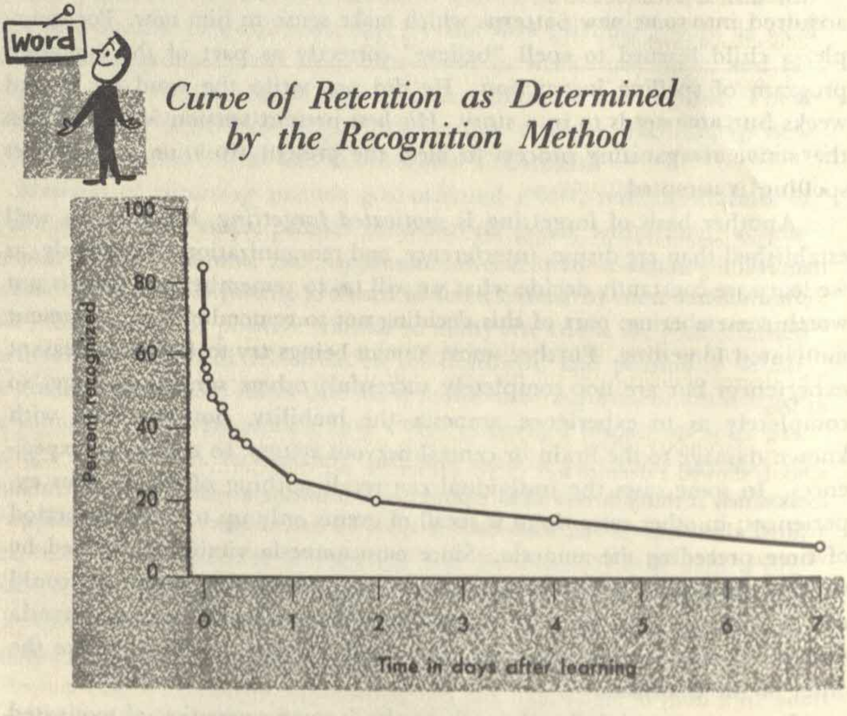

FIGURE 12.1. *(Adapted from Strong, 1913, p. 357.)*

made by students enrolled in a general psychology course and, later, enrolled in a beginning course in educational psychology. Nearly 86 percent of the items answered correctly in June were also answered correctly in September; and 81 percent of the items answered correctly in February were answered correctly in September. McKeachie and Solomon (1957) found a much higher degree of retention than they had anticipated and suggested further that a curve of retention as shown in Figure 12.1 is inapplicable to more meaningful material. The same conclusion was reached about retention of socially useful, meaningful arithmetic problems by children of low, average, and high intelligence (Klausmeier and Feldhusen, 1959).

TABLE 12.1. Percentage of Correct Answers to Examination Items

	Pretest	End of General Psychology Course	Beginning of Educational Psychology Course Sept., 1954	Percent Retention
19 items common to June, 1954, and educational psychology tests	54.03	73.5	70.7	85.6
18 items common to Feb., 1954, and educational psychology tests	41.12	78.0	71.1	81.3

SOURCE: *McKeachie and Solomon, 1957, p. 111:*

An extensive review of studies dealing with retention of subject matter by elementary, high school, and college students points to differential retention of various outcomes:

1. *Elementary-school subjects.*—Studies in elementary-school subjects indicate that reading ability tends to increase during summer vacation. Studies of history show a difference in the rate of forgetting types of historical material: a gain in the second test in the case of easy material but a loss for more difficult material. Arithmetic studies tend to show that advanced material is more easily lost than fundamentals. The degree of difficulty of the material studied appears to affect the rate and amount of loss.

2. *Secondary-school subjects.*—Studies conducted in mathematics in secondary schools showed a definite loss varying from ten per cent during the summer vacation to as much as thirty-three and one-third per cent during a year interval. In a standardized algebra test some items were retained by one hundred per cent of the class whereas other items showed a one hundred per cent loss. In some of these studies there would appear to be little relation between amount of initial acquisition and the amount retained. Studies in science show a definite loss varying with different types of material. Retention appears higher in the area of general information and application of facts and lower in ability to recall chemical terms and to write equations. In a study of high-school and college chemistry, high-school seniors showed a forty-two per cent loss of informational material after a period of three months. After a five-year period college students were able to recall approximately nineteen per cent of the informational material studied in high-school chemistry.

3. *College subjects.*—Studies in college science courses show a definite loss over the time intervals measured. The amount of loss varies from fifty per cent over a four-month period to as high as ninety-four per cent loss of initial gain after one year. The greatest loss appears to be in technical information with little loss in ability to apply principles to new situations. Retention in general subject-matter areas after an interval of four years or more indicated highest retention in United States history, ancient history, and geometry whereas the lowest retention was in physics, chemistry, and Latin. In a world history test given to college freshmen, retention scores appeared to be closely related to grades received in high-school courses. In an American history test based upon factual information, a group of college girls showed a loss of forty per cent of the initial acquisition after one year [Sterrett and Davis, 1954, pp. 455–456].

The above summary shows that retention is related to varying types of learning outcomes and to their difficulty. In general, factual and technical information is forgotten rapidly; more general information, application of facts, and principles are retained better.

Unique Features of Memory and Forgetting

One often wonders why it is that an older person can recall many experiences which occurred early in childhood but cannot recall many which occurred during middle years of life. Similarly, with no apparent attempt to learn a skill or factual information an individual recalls or performs better after an interval of rest than he did preceding the rest; it appears that he has retained more than he had actually learned.

HYPERMNESIA. The older person is often able to recall incidents quite clearly from his early childhood that he could not recall at the age of forty to fifty; however, he appears not to be able to recall more recent happenings. This phenomenon cannot be explained fully; however, clinical psychologists and psychoanalysts use a variety of techniques with emotionally disturbed adults and find that with the use of hypnosis, certain drugs, and free association an individual can clearly recall events that took place many years earlier. Some individuals who have lost recollection of previous experiences owing to an intense shock of one form or another are found also to be able to recall many of the details preceding the shock that are not ordinarily recalled by most persons. Though the explanation of this phenomenon is not clear, it raises the question of the extent to which forgetting is ever complete within the life span of the individual. Long retention of early childhood experiences by adults age seventy and above, heightened recall under various abnormal conditions, and heightened recall under hypnosis, drugs, and psychoanalytic techniques suggest that the usual measures of forgetting which we use in laboratory and school situations may be showing effects of forgetting as being more complete and final than they really are.

REMINISCENCE. A person juggles two balls for the first time in his life for 10 minutes. At the end of 10 minutes he makes fifty consecutive catches. He then rests for 5 minutes, and upon juggling again makes sixty consecutive catches. Without practice and without further learning of any sort he has performed better than he did previously. In another situation a student is given forty words to spell. He studies these words for 20 minutes and spells twenty-five correctly. For the next 10 minutes he engages in a physical activity without further study of the words. Thereupon he takes the same list of words and spells thirty correctly; it appears that he remembers more than he originally learned. These better performances after a change in activity or rest are designated by the term *reminiscence*.

The better performance in juggling after rest is usually explained on two bases. With each successive try during the original learning there was some lessening of efficiency produced by fatigue–reactive inhibition; when the individual had completed 10 minutes of active practice some efficiency was already lost. The rest interval provided the needed time for the effect of fatigue, or reactive inhibition, to dissipate; when the juggling was started after rest, a better performance resulted. Another explanation is improvement with practice from the first to the second try. A level of skill was built during the first practice session and, after rest, further improvement occurred. Though both of these are reasonable explanations of reminiscence in connection with motor tasks, they are not as appropriate for such tasks as spelling and arithmetic, in which the amount of physical energy is negligible and in which individual items are missed—not learned. At the present there is no completely adequate explanation of improved performance in such cases—in the spelling example, for instance. Higher motivation might have been present in the second situation, since the individual has already experienced some success in the first situation.

Though these explanations are tentative, the important point is that in many school situations we expect to observe reminiscence, especially with psychomotor tasks. Irion (1949) found that on a simple motor skill involving the pursuit rotor (1) significant amounts of reminiscence occurred following a 5-minute rest interval which had been preceded by ten, twenty, thirty, and forty trials; (2) as the amount of rest between practice sessions increased there was at first a higher amount of reminiscence which then decreased; and (3) reminiscence was still found after five series of relearning trials at which time the subjects, college students, were getting fairly adept at the skill.

VIEWPOINTS ABOUT TRANSFER

The teacher, as well as others who decide what to teach, explicitly or implicitly accept a theory or combination of theories of transfer in making their decisions. Four theories in order of their historical origin are formal discipline, identical elements, generalization, and transposition. These four theories are discussed below; then common elements in the theories and negative and positive transfer are treated.

Formal-Discipline Theory

The formal-discipline theory of transfer arose before the brain and central nervous system were well understood, and it was assumed that the mind was composed of many separate faculties such as memory, reason, attention, will, and imagination. According to the theory, these faculties should be strengthened through practice much as muscles are strengthened; systematic drill in certain subject fields was thought to have the same effect as physical exercise of the body. Since the most difficult subjects in the late 1800's were supposedly Latin, Greek, and mathematics, they were thought to be the most desirable subjects and most useful for strengthening these faculties, and for improving the mind generally. In accordance with the theory, memory drills (it made little difference what was memorized) were employed to develop the memory faculties. Long and difficult assignments were supposed to develop the faculties of will power and attention. Further, subjects such as Latin, Greek, and mathematics were thought to have inherent qualities which enabled the simultaneous development of many of the faculties. In turn, as these faculties were well developed through education in the school, the results would automatically transfer to out-of-school situations, including the practical daily affairs of life.

Thorndike (1924), after studying the effects of different subjects taken in high school upon increase in students' ability to reason, concluded that one subject was no better than another for improving reasoning ability. As the courses were then taught, physics, trigonometry, Greek, and Latin produced no better reasoners than did physical education and dramatic arts; however, students who were enrolled in the more difficult courses made higher scores initially than did those who were enrolled in the more practical courses. Humphreys (1951) also concluded that (1) taking a course in English literature does not automatically result in the students' showing higher appreciation of literature outside the course, (2) teaching moral or ethical values in Sunday School does not necessarily have any effect on moral behavior outside the class, (3) a foreign-language course does not sharpen the intellect of those who take the course, (4) a laboratory course in physical science does not necessarily result in carry-over of scientific method to social sciences or biological sciences, and (5) a traditional geometry course does not necessarily result in an increase in ability to solve problems, except in geometry. It is a mistake to assume that there is automatic transfer from any subject field to any other subject field or to situations outside the school.

Though the theory of formal discipline has been disproved, considerable teaching is yet based on it, though it is stated in such terms as "mental discipline" or "intellectual discipline." Some teachers still justify the subject matter and their instructional procedures on such bases. In the previous discussion of outcomes of learning which may transfer it was shown that attitudes toward study, methods of study, and methods of adjustment which students acquire in some subjects may transfer to other subjects or situations. A generalized attitude toward doing one's best, an efficient method of acquiring facts and concepts, and adjusting to new situations by goal-oriented effort do transfer to a variety of situations. It is possible that some teachers who use such terms as "intellectual discipline" and "mental discipline" are referring to these more generalized attitudes and methods.

The above discussion is not meant to imply that students should not work persistently to acquire learnings which challenge their best abilities.

Nor does it deny that the teaching of moral and ethical beliefs, combined with punishment or creation of guilt feelings, can lead to firm acceptance of those beliefs. In addition, there is sufficient evidence about schooling in Germany and Japan before World War II to indicate that individuals can be taught to accept ethnocentric and nationalistic attitudes in school which transfer to many situations outside school. However, we may safely infer that the school which wishes children to develop speaking facility in French offers French instruction with emphasis on speaking, for a child does not learn to speak French fluently by studying Latin or Greek. The school which intends to prepare girls for secretarial positions upon graduation offers some instruction in typing, shorthand, and bookkeeping. Equally important, the bright high school student intending to enter a profession, via higher education, concentrates most of his studies in English, mathematics, science, social studies, and foreign language—not to train his mind or to become intellectually disciplined, but to acquire such outcomes as mentioned early in this chapter which will transfer to higher education and an eventual career.

Identical-Elements Theory

The identical-elements theory assumes that elements present in the original learning situation must also be present in the new learning which it facilitates if transfer is to occur. The identical elements may be facts, skills, or methods. Thus, after the student has mastered the addition facts, he can use them in other problems wherein the same facts appear. After he has mastered skill in using an index in one book, the skill transfers to other indexes that are organized in a similar way. This theory, as set forth by Thorndike (1913), along with his other research, provides a more reliable basis for considering transfer than does the formal-discipline theory.

If one follows this theory in curriculum construction and teaching practice, he puts into the school instructional program the more specific facts and skills which are used by children and adults outside the school situation. When an educational goal is to help boys get jobs in factories, courses in welding, machine operation, woodworking, auto mechanics, blueprinting, and the like are offered. In rural areas boys are given instruction in animal husbandry, soil conservation, and allied subjects in order to help them assume their role as farmers. The hundreds of different courses of a vocational nature now offered in large high schools, colleges, and universities suggest the importance of the identical-elements theory. Many universities offer graduate programs leading to the Ph.D. degree in agriculture, music, art, home economics, physical education, and the like. Though the requirements for these advanced degrees include some study in general education areas such as English, social studies, science, and language, a heavy portion of the graduate requirements are highly specialized courses in the particular field. And a large number of persons with Ph.D.'s in English, social studies, science, and the like make their livelihood through teaching and related activities. Their Ph.D. preparation is also vocational to about the same extent as that for the physician, home economists, and the like.

In elementary education, the idea of identical elements led to identifying vocabulary and arithmetic facts used by children and adults. In turn these many specific facts were incorporated into the curriculum requirements or course of study. The large mass of specific facts or specific skills resulted in much drill with low meaning; further, situations may be very much alike and yet be perceived as quite different, so that the specific facts and skills are not applied. In multiplication, for example, placing a decimal point in the multiplier and multiplicand makes the problem different in some respects. Some pupils perceive the problem as so different that they do not attempt to transfer their facts and skills in adding, subtracting, and multiplying by which they could solve the problem (except for the proper placement of the decimal point in the answer).

Generalization Theory

Judd (1908) had two groups of fifth- and sixth-grade boys engage in an experiment in which the task was to throw a small dart at a target placed under water. One group of boys was given a full theoretical explanation of refraction before starting and the other group was given no explanation of the principle. Both groups began their practice with the target placed under 12 inches of water; the same amount of practice was required for both groups to reach the same results. At this point knowledge of the principle appeared to be of no value; however, the task was now changed only to the extent of reducing the level of the water from 12 to 4 inches. The difference between the performance of the two groups was striking in that the boys with the understanding of the principle performed the task much more efficiently than did those without the understanding. Judd concluded that it was not the identical elements in the two situations which transferred but the understanding of the principle of refraction.

Hendrickson and Schroder (1941) replicated the Judd experiment as nearly as possible with eighth-grade boys. They found that (1) understanding the principle facilitated positive transfer, (2) understanding the principle also facilitated the original learning, and (3) the completeness of the theoretical information had a direct effect upon both initial learning and transfer—the more complete the information the better the results.

Transfer by generalization is an extension of transfer by identical elements. Unless the new situation has enough in common with the previous one for the learner to perceive applications, no transfer occurs. Generalization provides a more mature and a broader viewpoint toward effective curriculum and teaching practices. When the teacher is freed from attempting to have pupils master a large number of specific facts and skills in many different subjects, other more interesting and meaningful activities can be organized and more efficient learning is achieved. More long-term projects and assignments, problem-solving activities, class discussions, and units of work which stress broad principles and generalizations can be used, rather than short, unrelated daily lessons which emphasize the acquisition of many specific facts, skills, and attitudes.

Transposition Theory

The gestalt psychologists of Germany are credited with the theory of transfer by transposition and, upon their emigration to the United States with the rise of Hitler, transmitted their ideas to us. The theory of transposition goes farther than that of generalization in that the entire pattern or the mean-ends relationships are proposed as the basis of transfer. For example, after an individual recognizes the "Star Spangled Banner" in the key of F, he readily recognizes it when it is transposed into the key of G, though no individual note is the same in the two keys. Applied to the dart-throwing experiment of Judd, the gestalt theory would suggest that it is not only the principle but the individual's entire perceptions of the relationships between the principle, the use of the dart, the depth of the water, and the placement of the target that transferred. Transposition applied to arithmetic means that the specific facts and skills of addition, even the principle underlying addition, are not the basis of transfer from the school to an out-of-school situation; instead, it is the understanding of the *relationships* among the facts, processes, and principles. Kuenne (1946) demonstrated a relationship between mental age and the occurrence of transposition in young children. With children at forty-two months of age and younger transposition did not occur; however, it occurred increasingly with older children, and at a mental age of seventy-six months 100 percent transposition was obtained. This study is evidence of transposition, not a contradiction of the identical-elements or generalization theory.

Common Elements in the Last Three Theories

The last three transfer theories of learning discussed previously are based on reliable evidence that transfer occurs, but are not in agreement concerning what it is that transfers. In the identical-elements theory, it is the more specific facts, skills, or attitudes; in generalization theory, it is the principles; and in the transposition theory, it is the broader patterns of means-ends relationships. However, for transfer to occur, according to any theory, the individual must perceive the new situation as being somewhat similar to that in which the original learning took place. Further, the conditions under which the original learning is acquired and the extent to which it is acquired are closely related to the direction and amount of transfer. Poorly acquired material shows less transfer than that which is well acquired and the conditions under which original learning is acquired may lead to negative or positive transfer. The time interval between learning and transfer, mental ability, and such affective characteristics of the individual as interests and attitudes also affect the extent and direction of transfer.

Positive and Negative Transfer

Though an outcome may be acquired and remembered well, transfer of learning is not automatic and may be negative, positive, or negligible. Negative transfer was discussed in some detail in Chapter 7 in connection with problem-solving. When an individual learns to use some information, instrument, or method of approach in a particular way to solve a problem successfully, he tends to persist in the same use of the information, instrument, or method though it does not lead to solution of a new problem (Birch and Rabinowitz, 1951). Positive transfer is illustrated in those situations where an outcome learned in one situation is remembered and is applied to a new situation. Neither negative nor positive transfer occurs when the learning in one situation is not perceived by the individual as related to a new situation.

Proponents of the idea of learning for its own sake, that is, the acquiring of knowledge or skills simply in order to understand or to perform better, are justified in suggesting that every student should engage in some of this type of activity; however, those who are concerned that the school should encourage outcomes which will transfer to situations outside the school are very much concerned with positive and negative transfer. For example, an individual who spends four or five years after high school graduation to become a teacher and one who spends eight or more years to become a psychologist or physician are wasting much time and energy in higher education if there is negative transfer or no transfer to their subsequent careers.

PRINCIPLES FOR ENCOURAGING RETENTION

Principles for encouraging retention follow logically and psychologically from those previously stated in Chapter 6 to 10 dealing with efficiency of acquiring learning outcomes. It is also apparent that no learning transfers unless it is retained. The six following principles are discussed in this context as the link between acquisition and transfer:

1. Foster intent to learn well and remember.
2. Make the original learning meaningful.
3. Provide for satisfying consequences of original learning.
4. Distribute practice and review.
5. Avoid interference and faulty reorganization.
6. Provide for sequential cumulative learning.

1. *Foster Intent to Learn Well and Remember*

Undergraduates in an educational psychology course were given a passage of about fourteen hundred words on the history of dope addiction (Ausubel, Schpoont, and Cukier, 1957). One group (the control group in this experiment) was instructed to read the passage at normal speed, to use the remainder of the period to study the facts and ideas in the selection, and to be prepared for a test that would immediately follow their reading and study. Fourteen days later they were given a second unannounced test of retention, using an equivalent form. The same procedure was used with an experimental group except that immediately after completing the first test this group was told that another test on the same material would be given in fourteen days. The scores of the two groups were about the same on the first test. The experimental group, told at the end of the first test that it would be retested in fourteen days, scored lower than did the control group on the retention test. These results led to the conclusion that intent to learn facilitated retention and that intent to remember when introduced after learning had little effect on retention. The implication for classroom teaching situations is that intent to learn and remember should be encouraged before the pupils start the learning task rather than after the teaching is completed.

Intent to remember is inherent in goal-setting and attainment, as discussed in Chapter 11. The student who has set a realistic goal in connection with school learning tasks achieves higher than one who has set no goal or an unrealistic one. Further, if the goal is not immediately attained, there is high intent during each successive practice or study period to recall what has been learned previously in order to make progress toward the goal. Thus, with material as shown in the paragraph above, the teacher may use a test as an external incentive to promote intention to learn and remember, whereas in goal-setting situations the incentive is not necessary. But in both cases, intent to learn and remember facilitate retention.

2. *Make the Original Learning Meaningful*

Though many experiments have been done with meaningless tasks, such as memorizing nonsense syllables, in order to arrive at a better understanding of forgetting, it is now clear that meaningful tasks are forgotten much less rapidly than are meaningless ones. Some tasks are, of course, inherently less meaningful than others, but the teacher can do much to encourage meaning. For example, the symbol × in arithmetic can be defined verbally as meaning "multiplied by" or "times"; it can also be explained and demonstrated as standing for the process of multiplication—a means of adding efficiently, i.e., $2 \times 3 = 3 + 3$, $3 \times 3 = 3 + 3 + 3$.

Figure 12.2 shows curves of forgetting, using different kinds of material (Gilliland, 1948). The curves for nonsense material and for poetry are based upon previous investigations, whereas those for observational material and loss in confidence are drawn from Gilliland's original data. In the test of retention of observational material the subjects were told to try to remember everything they saw when shown a picture of a detailed office scene. Each picture was presented and the subject was permitted to look at it for thirty seconds. Three sets of eleven questions each were based upon the picture content. One set was given to test immediate memory, another set was presented 48 hours later to measure retention, and the third set 7 days later to one group of subjects and 30 days later to another group. Retention was measured in percent of correct recall. One group of eighty-eight subjects recalled 85 percent after 48 hours and the other group recalled 80 per-

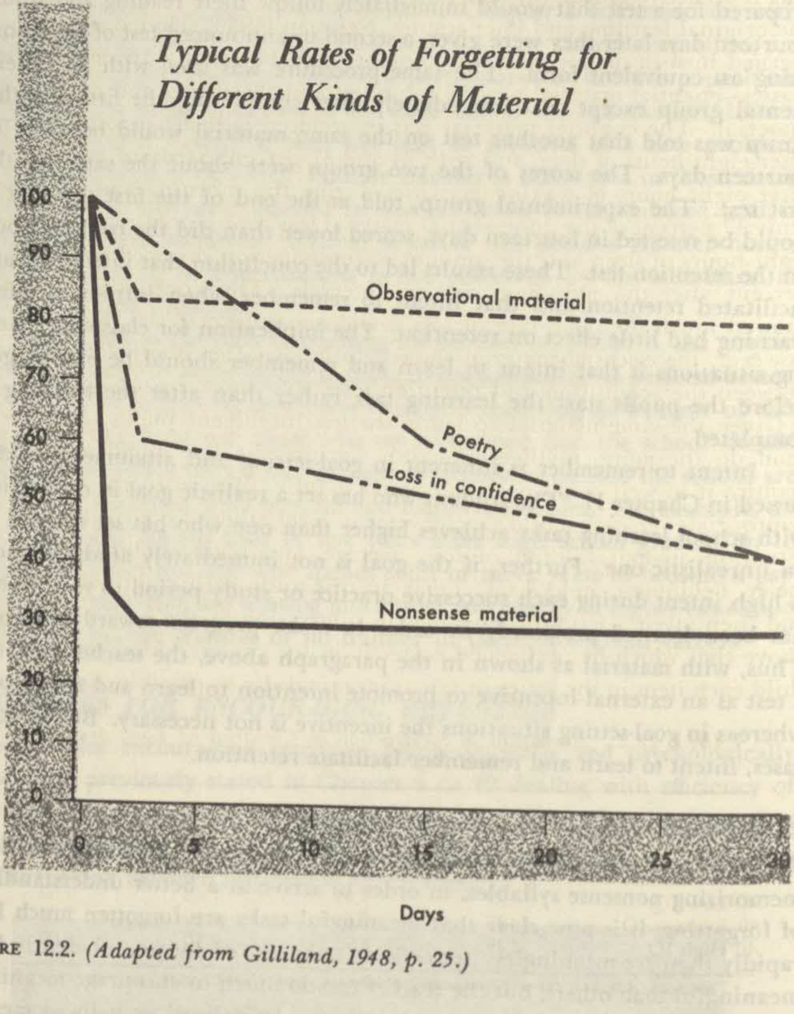

FIGURE 12.2. *(Adapted from Gilliland, 1948, p. 25.)*

cent, as shown in Figure 12.2. The subjects were asked also to indicate their confidence in the answers given, that is, if they would be "willing to swear" to the correctness of their answers. Confidence showed more rapid loss than did recall of facts.

Meaningful material is recalled better after sleep and also after regular daily activities than is meaningless material. Accepting the idea that forgetting is an active process influenced by various activities interpolated between the original learning and later testing, Newman (1939) selected stories to be learned in such manner that the content could be readily divided into two classes—essential material needed to understand the stories and nonessential material. The essential material was reproduced with 87 percent accuracy after eight hours of sleep and with 84 and 87 percent accuracy, respectively, after eight hours of waking activities during the morning and afternoon. Only 47 percent of the nonessential material was reproduced accurately after eight hours of sleep and the amount of reproduction dropped to 25 and 19 percent after the eight-hour waking intervals. The nonessential material showed much the same rate of loss as did nonsense material (Figure 12.1); however, the essential material showed little loss after interpolated activity between the acquisition and retention tests.

Given the same material to learn, the less intelligent pupils forget more than do the more intelligent, mainly because the less intelligent do not acquire it so well or do not understand it fully. But when the material is appropriate to each child's achievement level, there is no difference in retention among children of low, average, and high intelligence (Klausmeier, Feldhusen, and Check, 1959). In this study each child was pretested and then given a series of ten items in subtraction at the level of difficulty above that which he performed correctly in the pretest. After teaching the child each item in the series of ten as meaningfully as possible, the researchers administered an acquisition test; the mean or average scores for the three groups are shown in Table 12.2. A 5-minute interpolated activity followed the acquisition test and consisted of the child's listening to a tape-recorded selection of music and stories, an exciting, attention-holding device. The retention scores after this interpolated activity went up slightly for

TABLE 12.2. Retention in Subtraction in Children of Low, Average, and High Intelligence

Group	Mean IQ	Mean Score: Acquisition	Mean Score: 5-Minute Retention	Mean Score: 7-Week Retention
40 Low IQ	67	7.97	7.80	7.32
40 Average IQ	105	7.85	8.10	7.20
40 High IQ	129	8.95	9.10	8.02

SOURCE: *Adapted from Klausmeier, Feldhusen, and Check, 1959, pp. 12, 69.*

two groups, illustrating the previously discussed phenomenon of reminiscence. When the same test was repeated seven weeks later, retention was much the same for the three groups, slightly above 90 percent. Precisely how well the teacher can arrange learning tasks of the proper difficulty level for each child in usual classroom situations is uncertain. And the difficulty of the task for the child is, of course, related to meaningfulness. The results from all the research are clear; namely, material which is meaningful and acquired at a fairly high level of mastery is retained well.

3. Provide for Satisfying Consequences of Original Learning

As was shown in Chapter 11 on motivation, the unpleasant effects of failure and punishment retard learning, whereas the pleasant effects of success and reward facilitate it. In about the same way feelings of success and pleasantness and of failure and dissatisfaction are related to recall. Experimentally induced threat to the individual results in poorer recall of material than does no threat, and subsequent alleviation of threat results in better recall (Aborn, 1953). A more pleasant, cooperative atmosphere under a democratic leader facilitates the recall of factual information more than a competitive atmosphere under authoritarian leadership (Yuker, 1955).

Deliberate attempts to produce unpleasant feelings in connection with learning activities are thus to be avoided. Instead, if the original learning activities can be so managed that satisfying consequences are experienced by the learners, the original learning is confirmed and can be recalled and used in subsequent situations. Difficult tasks which challenge the learner but which he can master are recalled well and are not inherently unpleasant. They may become so if the learner is punished or reproved for not doing well, rather than being praised for consistent trying.

4. Distribute Practice and Review

The desirability of distributing rather than massing practice was shown in connection with the learning of facts in Chapter 6 and the learning of skills in Chapter 8. Some important factual material in most subject fields cannot be acquired with a high degree of meaning. Overlearning of spelling words, some arithmetic facts, and facts in social studies and science is often accomplished through systematic review. That is, after twenty spelling words are acquired during one week, systematic review of these words is given during the remainder of a semester or year. This overlearning, repeating the correct spellings in each review session, facilitates permanent retention.

In classroom situations, many outcomes besides facts and skills are not acquired completely and permanently the first time they are encountered. Tiedeman (1948), working with 1055 fifth-grade children, arranged a situation whereby testing and reviewing were accomplished simultaneously with prearranged groups of children at intervals of 1 day, 14 days, 28 days, and 63 days. Retention of many important outcomes of classroom learning improved significantly with systematic review. Best results were secured when the review tests were administered 1 day after learning rather than later. Also, incorrect or erroneous concepts that were not corrected persisted; if the pupils made errors which were not corrected, they tended to accept and retain the errors as correct.

How much review of material is needed in various classroom situations for a given learner is unknown, but we are certain that the less meaningful and less well-acquired material must be overlearned immediately, and must subsequently be reviewed more often than meaningful and well-acquired material. Also, if original learnings were more complete, more meaningful, and used more frequently in subsequent ongoing learning activities, there would be less need for formal reviews. For example, if eleventh-grade students learned history more completely at that time and used what they learned subsequently in the twelfth grade, less review of the same material would be needed in college courses. Underwood (1957) postulates that the cause of forgetting is primarily interference from previously learned habits, from habits being currently learned, and from habits yet to be learned. He also suggests that the amount of interference is primarily a function of the similarity between or among learnings tasks and of the strength of associations made among stimuli and responses. His conclusions are based primarily on experiments in which materials of relatively low meaning are used and are acquired mainly through rote learning.

5. *Avoid Interference and Faulty Reorganization*

Table 12.3 is an application of the effects of interference on remembering. Suppose that students take beginning conversational Spanish during the

TABLE 12.3. Effects of Interpolated Activities on Remembering

I. Learning Activity, First Class Period	II. Interpolated Learning Activity, Second Class Period	Effect of II on Remembering I
Beginning Spanish	Spanish history	Positive and small
Beginning Spanish	Mathematics	Small and possibly negative
Beginning Spanish	Beginning French	Negative and large

first period. This class period might be followed by Spanish history, mathematics, or beginning conversational French. Spanish history immediately following conversational Spanish has a positive effect on remembering conversational Spanish, since the two are complementary and do not interfere with one another. A mathematics class has little effect on subsequent recall of conversational Spanish, since it neither complements nor interferes with it. French immediately following Spanish has a large and undesired negative effect on remembering the Spanish. French, though similar to Spanish, does not complement but interferes with the Spanish; the same stimuli, English words, call for different responses in Spanish and in French, and this is the source of interference and confusion. It is possible that the French might be taught in such manner as not to interfere with beginning Spanish. However, if the emphasis is on acquiring vocabulary and the same words in English are used in both beginning Spanish and French, two undesirable effects are possible: the French decidedly interferes with remembering the Spanish, and the initial Spanish instruction markedly interferes with acquiring beginning French. The terms ascribed to these phenomena are *retroactive inhibition* and *proactive inhibition.*

Meaningful material is not subject to interference to the same degree as nonsense material. Hall (1955) obtained results with meaningful material as shown in Table 12.4. The control group received rest after the original learning; Experimental Group 1 received dissimilar material that supposedly would not produce interference; Experimental Group 2 received similar material that would supposedly produce interference. Immediately after these interpolated activities, there was practically no difference in recall of the original learning by the three groups; and after 45 minutes and 21 days, the amount recalled was much the same for the three groups. Thus, interpolated activity similar to the original learning did not produce forgetting. It is of some interest, too, that after 45 minutes the experimental group which had received dissimilar material for the interpolated activity showed some reminiscence.

TABLE 12.4. Number of Completion Items Correctly Recalled

Group	Kind of Interpolated Material	*N*	Immediate		After 45 min.			After 21 days		
			Mean	σ	Mean	σ	Percent Recalled	Mean	σ	Percent Recalled
Control	Rest	14	23.36	3.80	23.14	3.56	99.1	18.93	3.08	81.0
Exp. Gp. 1	Dissimilar material	15	23.20	3.27	23.53	3.34	101.4	19.33	3.93	83.3
Exp. Gp. 2	Similar material	16	23.31	2.14	22.94	3.84	98.4	18.81	4.59	80.7

SOURCE: *Hall, 1955, p. 50.*

Ausubel, Robbins, and Blake (1957) divided a group of 188 undergraduate college students into an experimental and three control groups. All students studied a 1700-word passage on Buddhism and were tested immediately after learning and 8 days later. The interpolated learning sessions were carried out 24 hours after the original learning and were so arranged that (1) the experimental group learned a passage explicitly comparing Buddhism and Christianity, (2) one control group restudied the Buddhism passage, (3) another control group studied another passage dealing solely with Christianity, and (4) the last control group was not subjected to any interpolated learning activity. Proactive rather than retroactive inhibition was found to be the determining factor in forgetting, and interpolated material, substantively similar to but not identical with the original learning did not result in retroactive inhibition but facilitated retention. These researchers concluded that retroactive inhibition is an important determining factor in forgetting only in artificial laboratory situations employing nonsense learning tasks and is at most a relatively minor variable in retention of newly learned school material. This last conclusion assumes that in school learning situations none of the material is meaningless nor is it acquired by rote methods. However, the acquisition of a foreign language, the learning of shorthand symbols, and the learning of important facts in many subject-matter fields is partly through rote methods and for many pupils cannot be highly meaningful.

Faulty reorganization results not so much from retroactive inhibition as from lack of thorough learning in the first place. At this point try to recall the four principles for improving retention discussed thus far. If you can recall them, neither interference nor faulty reorganization have occurred; however, it is possible that after reading and studying the first four principles and then following with study of the present principle, you may not be able to recall them because you did not master them fully in your first study. In any event, the statements which you recall as the principles are your reorganized version of them which you are likely to accept as correct unless you check back with the original statements.

Both interference and reorganization hinder retention. The best possibility for improving retention is to make the original learning meaningful and thorough. Beyond this, students should not be scheduled for successive classes wherein similar but noncomplementary material may result in either proactive or retroactive inhibition. Similarly, in studying for final examinations the better practice is to study last in the evening for the examination which comes first the next day.

6. *Provide for Sequential Cumulative Learning*

Most skills, concepts, attitudes, and methods of work are not acquired fully in one day, week, or year but cumulatively through distributed practice and study over a period of time. We must recognize that human knowledge as now incorporated in such broad fields as mathematics, science, foreign language, shorthand, and music requires learning over a period of many years. The people who outline the general sequence of instruction from kindergarten through Grade 12 must give careful consideration to appropriate learnings at each grade level so as to encourage continuity in learning. At the same time the teacher is daily faced with the problem of deciding how large or comprehensive a unit of learning to attempt in order for the student to acquire something that can be carried through to the next day or week.

Obviously if nothing is learned today, it cannot be retained or used tomorrow. In spelling, for example, it is better for the elementary school child to learn three words well each day of the week than to be given fifteen words at one time and end up at the end of the week not knowing any of them. In foreign language instruction also, it is better to emphasize a smaller number of new vocabulary items to master daily than to give a large number and, in the process, encourage interference and reorganization to the point that nothing is recalled. Science instruction is much the same; to attempt to make physicists out of tenth- or eleventh-grade pupils is unrealistic. Instead, the study of physics in high school must be organized into appropriate segments in which the student learns well; in turn his knowledge, skills, interests, and attitudes enable him to continue further study of physics in college. Eventually he may even become a physicist.

PRINCIPLES FOR FACILITATING TRANSFER

Though studies of retention are based on the idea that the situation in which retention is tested is identical to the original learning situation, there are often minor differences in the attitudes and motives of the learner and in other details of the retention situation. If the retention situation is quite different from the original one, transfer as well as retention is measured. Since transfer is impossible without retention, the principles which were discussed for improving retention apply also to facilitating transfer. But though retention may be excellent, transfer is not automatically assured. We turn now to four principles in facilitating transfer:

1. Emphasize learning outcomes that readily transfer.
2. Develop meaningful generalizations.
3. Assist the learner to make applications.
4. Evaluate the learner's ability to apply responses to new situations.

1. Emphasize Learning Outcomes That Readily Transfer

When transfer is sought it is important for the teacher to identify the outcomes to be learned well, retained, and transferred by the students. We cannot assume that students studying Latin will independently select the Latin words on which many English words are based. Students in geometry cannot identify the many possible applications of geometric facts and principles to their daily activities or to subsequent careers in engineering or architecture. Besides identifying, the teacher also has responsibility for emphasizing those outcomes which have greatest possibility for transfer. The previous discussions have shown that general information, generalizations and principles, methods of learning, generalized attitudes, and methods of adjustment have greater possibility of transfer to many situations than specific facts and attitudes, technical information, and any other outcomes acquired by rote procedures.

2. *Develop Meaningful Generalizations*

Fourteen hundred third-grade children, enrolled in forty-one classrooms of four school systems, were taught subtraction either by a meaningful (rational) method or by a mechanical (rote) method (Brownell *et al.,* 1949). Those taught by the rational method were given a variety of suggestions in understanding the process of "borrowing" in subtraction. The other group was taught one mechanical method and then drilled, using exercises wherein borrowing was required. Those taught by the rote method made more rapid progress in the first few days, since the meaningful method required more time to learn; however, at the end of fifteen days they were already dropping behind those taught by the meaningful method. More important, when a transfer situation was arranged, those who had been taught understanding of subtraction performed far better than those who had not. An example clarifies the basis on which these and similar results are obtained. If a child understands that adding is counting upward and is taught, when first encountering 3 + 3, to count three somethings (dots) and three more somethings (dots) to get six, as he subsequently meets a new fact such as 6 + 4, he can independently get the correct answer by making six dots and four dots to get ten. If the child is taught the addition facts by rote, that is, if he is presented the facts to memorize but does not understand that adding is counting upward, when he meets the transfer situation, 6 + 4, he does not know what to do. Some children, of course, arrive at the generalization of counting upward independently. However, in the Brownell study even bright children did not understand the process of borrowing when taught by rote methods and therefore were unable to transfer.

In a situation with somewhat better control Hilgard, Irvine, and Whipple (1953) studied the performances of sixty high school students. Problem-solving tasks were presented to the students, with one group being taught the solution by memorizing and the other by understanding. In this situation (1) more time was required to teach the problems initially to the understanding group than to the memorizing group, (2) overnight retention was equal for the two groups, and (3) the understanding group did significantly better than the memorizing group on all three problems used in measuring transfer. In a study of a slightly different design college students who were given the principle for completing a task acquired the task more efficiently than did those who had to discover the principle (Haselrud and Myers, 1958). However, on a subsequent transfer test the group which developed its own principle and apparently understood it better performed significantly better than did the group which had been given the principle.

Whether the desired outcome is a skill, concept, attitude, or method of work, it is desirable to help students understand the underlying generalizations. Though acquiring the generalizations usually takes more time than does proceeding by rote memory, transfer to new situations is definitely improved. Apparently, when a person encounters a new situation, he sees greater possibility for applying the varied responses by which a broad generalization was derived than the more specific responses themselves.

3. *Assist the Learner to Make Applications*

Students may study and enjoy Shakespearean plays for the inherent satisfactions derived. If, however, the study of Shakespearean plays is to assist in better interpretation of English history or of the present scene in England or America, most students need help in applying the pertinent ideas from the plays to the modern scene. The applications might take the form of comparing Shakespeare's style of writing and modern writing, the characters in his plays and in modern plays or in life generally, the themes of his plays and themes that exist in modern living, and so on. With other cognitive, psychomotor, and affective outcomes as described earlier, practice and use of newly acquired learnings in a variety of situations facilitates transfer.

4. *Evaluate the Learner's Ability to Apply Responses to New Situations*

It is easier to devise paper-and-pencil tests to assess knowledge acquired and retained than it is to devise tests and other techniques to ascertain whether the knowledge can be applied. Skilled performances also can be assessed fairly directly as the student engages in the skill, but it is more difficult to determine whether the skill can be applied to a situation outside the school or in any situation somewhat similar to the classroom setting. Interests in activities and attitudes also can be fairly well assessed through oral questioning and written tests, but much less progress has been made in ascertaining the extent to which expressed attitudes and interests actually guide behavior outside the immediate situation. As the athletic coach tries to observe the transfer effects of various forms and amounts of practice to actual contests, so also the teacher in history, chemistry, and other fields needs to arrange situations whereby the extent of transfer from the classroom to other situations can be appraised.

SUMMARY

Facts, concepts or principles, skills, attitudes, interests, methods of learning, and methods of adjustment acquired in one situation may be remembered and transferred to another situation. The type and amount of transfer may range from high positive to high negative. What is acquired must be remembered when the new situation is encountered; otherwise, no transfer results.

Forgetting is explained by different theorists as resulting from lack of use, interference, reorganization, and motivation to forget. There is general agreement that (1) meaningful material is retained better than meaningless, (2) material acquired with purpose is retained better than that without purpose through rote procedures, (3) facts, technical information, and isolated skills are forgotten more rapidly than general information, principles, general attitudes, general skills, methods of learning, and methods of adjustment.

Three generally accepted theories of transfer are identical elements, generalization, and transposition. All three theories accept the idea of positive transfer but disagree on precisely what transfers. According to any theory, however, the individual must perceive the new situation as being somewhat similar to that in which the original learning occurred.

Retention is encouraged by: (1) fostering intent to learn well and remember, (2) making the original learning meaningful, (3) providing for satisfying consequences of the original learning, (4) distributing practice and review, (5) avoiding interference and faulty reorganization, (6) providing for sequential cumulative learning.

Positive transfer is facilitated through: (1) emphasizing learning outcomes that readily transfer, (2) developing meaningful generalizations, (3) assisting the learners to make applications, (4) evaluating the learner's ability to apply responses to new situations.

QUESTIONS AND ACTIVITIES

1. (a) Discuss the relatedness of acquisition, retention, and transfer of learning.
   (b) Give three to five examples from your own experiences.
2. On the basis of your own experiences, which of the outcomes have most possibility for retention and transfer?
3. (a) Discuss each of the four explanations of forgetting.
   (b) Which is least useful in explaining why forgetting occurs? Give reasons for your choice.
4. (a) State three or four generalizations from the research cited about relation of the type of material to retention.
   (b) Discuss one possible application of each to a classroom situation.
5. In what respects are the phenomena of motivated forgetting and reminiscence alike? Different?
6. (a) Describe briefly the four theories of transfer.
   (b) Which theory is least satisfactory for you? Most satisfactory? Give reasons for your choices.
7. Discuss the meaning of positive and negative transfer, giving at least two examples of each from your own experiences.
8. (a) Select and restate as necessary the four principles of retention that you accept as the most useful guides to improving retention of what you learn.
   (b) For each of these, identify and summarize briefly a research report on which the principle is based. Refer as necessary to the original article or book.
9. (a) Why should a teacher not assume that transfer of learning from one situation to another is automatic; for example, from a course in educational psychology to a first teaching position?
   (b) What should the teacher do to be reasonably certain that transfer occurs?

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Chapter 13 Providing for Individual Differences

How are gifted and talented children identified? How are slow-learning and educable mentally retarded children identified? What educational provisions should be made within a school system or within a classroom to provide well for all pupils? The answers to these and related questions are complex and cannot be applied uniformly in school systems throughout the United States, for differences exist among communities in such factors as size, wealth, and support of the schools. Other factors within and among the children, their parents and home situations, and within already existing school arrangements also make it impossible to propose any one educational arrangement that will work equally well with all children from all homes in all communities. Though this is true, the school system in any community which does little or nothing to recognize and provide well for differences among pupils is not accomplishing the main objective of nurturing all abilities well.

DIFFERENCES IN ABILITIES AND GENERAL PROVISIONS

With the diverse and often conflicting proposals made by adults about the proper education of children, it is important for school people to formulate their own conceptions clearly. The author's point of view is now presented. The reader is invited to examine the following eight generalizations critically and to add, delete, or modify as he deems appropriate in terms of his values and knowledge:

1. Abilities exist on a continuum.
2. Abilities emerge and are improved with nurture.
3. Any ability any child possesses should be identified.
4. Educational provisions must be continuous.
5. Adequate facilities and materials are required.
6. Competent school staff is needed.
7. Individualization and grouping within the school are essential.
8. The common elementary school and the comprehensive high school serve uniquely American goals.

Abilities Exist on a Continuum

Suppose that in an elementary school the attempt is made to identify pupils who fit the following polar descriptions: intelligent–unintelligent, superior in reading–inferior in reading, skilled in handwriting–unskilled in handwriting. Before making the identification, a criterion of intelligence, a criterion of reading proficiency, and a criterion of writing proficiency would be necessary. After the criteria were agreed upon, what percent of the pupils would be classed intelligent and what percent unintelligent? superior in reading and inferior in reading? skilled in writing and unskilled in writing? Undoubtedly only a small percent of the total child population would be placed in any one of these three classes. The top 10 percent might be classed as superior in reading and the bottom 5 percent as inferior, leaving 85 percent as neither superior nor inferior. Further, the lowest pupils selected to go into the top 10 percent in reading might, by error of judgment, be no better than a considerable number who barely missed being included.

Though a larger group can be divided readily into two groups on such bases as male or female and above or below median chronological age, most individuals possess cognitive and psychomotor abilities ranging from a very low to a very high degree. One of the major problems in providing well for children is to assess their abilities accurately. The more reliable the assessment, the more likely are we to learn that there are many abilities and that they exist among individuals on a continuum rather than being present in some individuals and absent in others.

Abilities Emerge and Are Improved with Nurture

Outstanding or poor performances in adulthood are seldom assured at the time the individual is conceived. Though heredity is important in determining eventual adult performances, the environment is also, since hereditary tendencies emerge and are nurtured in an environment. Death by accident or disease in childhood illustrates the most undesirable environmental effect upon hereditary tendencies.

As was shown in Chapter 11, some needs, including biological and safety needs, are common to all human beings. These needs must be satisfied during infancy and childhood, as well as later, before the cognitive and psychomotor abilities can emerge fully. Younger children particularly must have rich opportunities to express themselves, and then they must have guidance of their emerging abilities. Otherwise we shall never know how they as adults may have achieved in an enriched environment. All children of the entire range of abilities and affective characteristics require good education, and much of it, in order to develop whatever talents may have been passed on to them through heredity.

Any Ability Any Child Possesses Should Be Identified

From kindergarten through the high school years and into college, any ability that any child possesses should be identified. We need to spend considerably more effort than we do at present in identifying abilities, starting early in school years. Our present identification procedures are better in the cognitive than in the psychomotor areas. But they are poor in art, music, dramatics, creative writing, dance, and social leadership. On the basis of IQ and achievement tests, we can predict much better than on a pure chance basis which third-grade children will finish high school in the upper one-fourth of the graduating class. We are much less effective in predicting which third-grade children will be the school leaders or in the upper one-fourth in art, music, or dramatics in the senior year of high school. Since World War II rapid progress has been and is continuing to be made in identifying abilities connected with verbal and mathematical performances, but very little is occurring in the fine and applied arts.

Educational Provisions Must Be Continuous

The brightest children entering our kindergarten and first grade are not, and should not be treated like, adults. Like all children they lack knowledge, experience, judgment, and are yet physically and socially immature as compared with adults. With an enriched environment in the home and neighborhood and excellent teaching in the school, they do develop physically, mentally, and affectively. Before finishing high school, they may be superior to their parents and teachers in many cognitive and psychomotor abilities. Without guidance and help they do not move suddenly from being first-grade children to being outstanding poets, artists, or even useful citizens. Slow-learning children and the large middle group also require continuity in education whereby previously acquired skills and knowledge are built upon and new abilities that emerge with maturation are developed.

Examine examples of lack of continuity. In one school bright pupils were grouped together for instruction in the sixth grade and mastered most of the curriculum requirements of the eighth grade in language arts, mathematics, social studies, and science. Upon completing the sixth grade, they went to a junior high school but were put in regular seventh-grade classes and treated as "average" seventh-graders even though they already knew most subject matter of the seventh grade. Slow-learning children were given special attention throughout their elementary school years and made reasonable progress. However, upon completing the sixth grade they also went to regular seventh-grade classes and were treated as of average achievements. But they could not read the textbooks of the seventh grade, were only at fourth-grade level in arithmetic, and could not understand the technical vocabulary of science. In another school, instruction in French for all children was started in the fourth grade and continued through the sixth. No further instruction in French was available until the ninth grade for any of the children who went to junior high schools in the community.

At present the greatest difficulties in providing well for children of the entire range of abilities is encountered as they move from the elementary school to the junior high school, from the junior high school to the senior high school, and for the more able students from the senior high school to college or to adult life without further education. Also, when children move from one school system to another, there is often poor continuity. We do not yet provide continuity of instruction from one school level to the next sufficiently well to avoid a marked slowdown in the educational process for many children.

Adequate Facilities and Materials Are Required

An excellent job has been done since World War II in getting the new school buildings, classrooms, and teachers for our rapidly increasing child population. This in itself is a highly significant accomplishment. However, in the planning of new buildings and in the securing of school facilities and equipment, the tendency has been to make only minor changes from the arrangements of the past, on the assumption that the same equipment and instructional materials could serve well the nurturance of all forms of abilities in all children. This practice may meet the needs of the larger percent in the middle, but is inadequate for the smaller percent who learn exceedingly well or with much difficulty.

Whether in heterogeneous age-graded classes with other children or in special classes or sections, bright children need some instructional materials more advanced than those for the other children. The slow learners also require reading materials different from the rest of the group. And just as swimming pools are needed for swimming instruction, science laboratories for science instruction, and typewriters for typing instruction, so also space and the proper materials are needed to nurture the creative abilities of pupils in English, mathematics, art, and other areas. The sensory handicapped, antisocial, and emotionally disturbed children also require special materials, equipment, and space that are usually not available in regular classrooms.

Competent School Staff Is Needed

The shortage of competent teachers, school psychologists, guidance workers, curriculum supervisors, and administrators becomes more acute each year. Some beginning provisions for improving the situation were incorporated in the National Education Defense Act of 1958. Even with the best facilities the education of children cannot be better than the school personnel doing the work. The abilities of many children will continue to go unidentified—much less be well provided for—until society recognizes the importance of well-educated and competent school staff and gives the necessarv financial support to schools.

And school people, when considering their positions and duties, are much the same as the population generally. Some cling to outmoded and inefficient practices and procedures. We yet have many small high schools with enrollments of less than one hundred students. A considerable number of one-room elementary schools are found with fewer than thirty pupils in all eight grades. A large number of young persons still start to teach in the elementary school with less than a baccalaureate degree. Many persons unfamiliar with job requirements or counseling procedures attempt to counsel students about critical educational and vocational matters. In part these undesirable conditions persist because present school personnel prefer to continue them. Some are opposed to any proposals for improving the profession and related learning opportunities for children.

Individualization and Grouping Within the School Are Essential

The principal means of providing for pupils of varying abilities and levels of achievement is through individualization and various forms of grouping. No means of grouping has yet been found which completely eliminates the need for some individualization.

INDIVIDUALIZATION. Many parents provide tutors for their children in music, art, dance, foreign language, and other fields. In the development of cognitive and psychomotor abilities, there is little doubt that a good teacher can do a better job with one pupil or a small number of pupils than with a large number. Though this is true, much can be done to arrange appropriate learning activities for individuals in larger groups. The elementary school teacher who has one group of about thirty for the entire day has an easier task than does the high school teacher with four or five classes of thirty to forty different students.

Individualized work in a mathematics class may be organized as follows: After the first class meeting the teacher, Mr. James, has learned the abilities of each student relatively well in mathematics. Further, he has worked out the entire program for the year in mimeographed assignments. These assignments start with the easy ones and progress toward more difficult. Each student early in the year makes a preliminary estimate of the rate at which he can complete the assignments and confers with Mr. James in deciding how far he will be, for example, after three or four weeks. Mr. James works with each student as an individual. Only a very short portion of the class period is devoted to such whole-class activities as taking care of routines and discussing mathematics generally. There is no general discussion of the specific concepts and skills incorporated in the various assignments. Each student works independently for most of the class period and, with help from Mr. James, proceeds at his own rate. By the end of the eighth week each of the thirty students is working on different assignments; none of them have proceeded at an identical rate.

In other age-graded classes, a portion of each class period is devoted to a common assignment, a whole-class discussion, seeing a film, and the like. The remainder of the class period (half or more) is set aside for the student to work on assignments and activities suited to him. This procedure is called "directed or supervised study." The teacher during this period works with individuals as they need help. In many cases the more able students work on activities beyond those required of the whole class; the students who are having difficulty receive additional attention and help from the teacher.

During the school day and outside regular school hours, the library can be used effectively for individualization. Modern school libraries have excellent facilities for reading, for listening to recordings with earphones, for study and work at tables on any assignments, for becoming familiar with current reading material such as newspapers and periodicals, and for acquiring important research skills.

Laboratory rooms for science, home economics, agriculture, and business education are generally arranged to permit individualization. In many schools these laboratories are open throughout the school day and before and after the closing of the regular school day. In foreign language and shorthand classes, laboratories are now being devised with self-instructional devices whereby students learn to read shorthand or to speak a foreign language at rates suitable to them. These facilities permit individualization; however, they can fail to achieve this purpose if all students are required to work on identical activities and to proceed at identical rates.

FORMS OF GROUPING. Though it is hard for persons from cities to visualize, in rural America of the past (and in some communities today) all boys and girls from ages five to twenty were brought together in one school room to receive their instruction. It was not uncommon for a sixteen-year-old to receive spelling and reading instruction with ten-year-olds. We now group pupils in age-graded classes on such bases as mechanical, friendship, interest, achievement level, and differential ability. These various bases of groupings are first discussed in the broad school setting and then in the smaller classroom group.

Mechanical grouping is widely practiced. Our present system of graded classes is mechanical for nearly all children in that the time at which a child enters the first grade is based on chronological age and not on any intellectual, psychomotor, or affective characteristic. Many school systems require that a child be not younger than five years nine months or older than six years nine months as of September 1 when he enters the first grade.

Unless there is some provision for acceleration or retardation, all go through the successive grades in twelve years, thus maintaining chronological age as the main basis for grouping into grade levels.

If a school has as many as ninety entering first-grade pupils, a mechanical arrangement may also be used for assigning them to three different classes of thirty each. The procedure is to list the children alphabetically and to select every third child for each of the three classes. Within such age-graded classes, other mechanical groupings are used for such purposes as getting pupils acquainted with one another and encouraging cooperative activities with all members of the class. In forming five or six smaller groups, an alphabetical arrangement may be used; students may count off from one to thirty and be divided according to number, or the rows of seats may be used. These mechanical bases of grouping are convenient; except by accident, they do not secure groups which are homogeneous in any ability or characteristic.

Friendship grouping is informally practiced by some college and high school students in selecting their elective classes, broader courses of study, and eventual careers. When given the opportunity, some students select classes in order to be with friends, much as adults select some work and recreational activities to be with friends. To the extent that similar interests and abilities are related to the formation of friendship, friendship groupings are more homogeneous than are groups based on mechanical arrangements.

Within a single classroom friendship grouping is sometimes used to deal with cliques or to get students to work together efficiently as quickly as possible. Friends do not need time to get acquainted and can get started quickly on the learning activity if they so desire. Students with antisocial attitudes are sometimes grouped together within a class rather than being distributed among several groups, in order that they can be worked with as a group. As a means of providing for differences in cognitive and psychomotor abilities, friendship grouping is little better than mechanical grouping.

Interest grouping is frequently done in the elective classes and cocurricular activities in high school and college. Also, when different patterns of courses are available, students with common interests select the courses which they feel are most in line with their interests. For example, college students interested in science concentrate their study in science, whereas those interested in literature concentrate in English. In much high school and college work, interest is thus an important basis of grouping, although such grouping is usually made informally by the students rather than being a part of the school's planning.

Within the smaller classroom group interest is often employed in arranging the entire class into smaller working groups. When a larger project is planned, students volunteer for the more specific related activities in which they are most interested. This is one of the best ways to form work or study groups, as was shown previously in Chapter 11.

Achievement-level grouping is used widely in the required subjects and, to a lesser extent, in elective subjects of the high school. Each student's achievement level in each of the several subject-matter fields is ascertained. Then the students of high achievement are put into one section or class, those of low achievement in another class, with the largest group placed in the middle classes. The high school that has three hundred ninth-graders may have fifty to sixty students in two high sections in the required English course, twenty to thirty in a low section, and the remaining two-thirds in six or seven sections or classes between. How many high and low sections may work best is, of course, related to the achievement level of the entire ninth grade, and this varies widely from one high school to another. It is not uncommon for the high school to use this type of achievement-level grouping in most of the required subjects.

Achievement-level grouping in reading and, to a lesser extent, in arithmetic and spelling is used within the same class in the primary and intermediate grades. The teacher ascertains which pupils are high, low, and in between in reading achievement. Three groups within this class are then formed for part of the reading instruction. The high group uses one type of reading material, the low group another, and those between use still another. Standardized achievement tests, IQ or scholastic aptitude tests, and teacher judgment are used in forming achievement-level groups in both the elementary and high school; this type of grouping is widely used in schools which have special sections for gifted students.

Differential-ability grouping is used within a class, not in assigning large numbers of pupils to separate classes or sections. For example, in an American history class five committees are formed to secure information on Federal support of education during each of the last five government administrations. The teacher wants each committee to include a student who can lead discussions well and get the group going in the desired direction, another student who reads and writes well and knows how to use the library, and still another one who can visualize information well. Each committee then also includes two or three students who cannot do any of these things particularly well. Knowing the students' abilities, the teacher organizes the five or six committees on this basis to obtain the desired results. Differential-ability grouping works reasonably well in most heterogeneous classes in providing for differences and capitalizing upon strengths; when it is used repeatedly, students of higher abilities spend considerable time helping those of lower ability.

The Common Elementary School and the Comprehensive High School Serve Uniquely American Goals

If instruction in art or foreign language is required of a portion of the children in an elementary school, should it also be available and required of all children? This question is concerned with the function of the common public school in America. Our tradition has been to make the subject-matter areas the same for all children, but to provide for differences in learning abilities within the various subject fields. Most schools still follow this practice through the sixth grade, with electives starting in the junior high school. Some schools, however, are offering foreign language, music, or art only to those children who achieve higher than most. It is possible that the latter schools are inadvertently and perhaps unintentionally drifting into the European pattern of education, attempting to identify the university-bound children at age nine or ten and then providing a different education for them. The author's judgment is that the elementary school, of all schools in the United States, has most clearly demonstrated its superiority over the European system of expensive education for the elite, and inexpensive, little, or no education for the masses. And European schools are increasingly patterning their system after the system in the United States.

In the Shorewood Hills Elementary School (Wisconsin) all children receive instruction in the usual curriculum fields from a regular teacher; and in art, music, and physical education from special teachers, from kindergarten through the sixth grade. Starting in the fourth grade every child receives instruction in French for thirty minutes daily during regular school hours. Though more money is needed to provide the special teachers in physical education, art, music, and French, any child's abilities in these fields may be expressed and developed by this arrangement. Further, only a low positive correlation is found between the ability of pupils to learn to speak French and their achievements in the usual school subjects. Children of average and lower abilities learn to speak French quite as readily as they learn to spell English words, so that the task of providing for differences is not greater in French instruction than in spelling. Had the entire child population of this school been born and reared in France, all would be speaking the French language well long before they reached the fourth grade.

The comprehensive high school can meet the needs of students representing the entire range of abilities and interests if it is adequately supported financially and has adequate staff and instructional materials. But it cannot work well when one English teacher is expected to provide well for 150 or more students representing the entire range of abilities, or when business education, home economics, industrial arts, and fine arts are treated as odious appendages to rather than essential components of the total instructional program. The comprehensive high school, if it is to survive, must accept all students as they come and provide instruction and guidance whereby each pupil is placed in classes that are profitable for him.

GIFTED AND TALENTED CHILDREN

The child who is already consistently superior in most areas of school instruction or who promises to be is called a gifted student. The one who is average in most fields but highly superior in one such as music, art, dramatics, science, or foreign language is called talented. These designations have emerged historically, and IQ is usually one criterion of giftedness. Whether gifted or talented, the student should be helped to develop his abilities fully. Both the talented and the gifted are included in the following discussion of: (1) objectives, (2) identification, (3) enrichment within heterogeneous age-graded classes, (4) acceleration, (5) sectioning and special classes, (6) special schools, (7) team teaching.

Objectives

What do we want gifted children to be and do as a result of education? Should their self-realization or their usefulness to society be given prior consideration, if this choice must be made? Should they become more alike or more different from one another with increasing education? More alike or more different from other children? The answers to these questions involve objectives based on value systems related to the individual and his contributions to society. Parents, and the children as they mature, should share with school people in making these decisions. And the decisions in part determine who is selected as gifted and what educational provisions are made. It is unwise for a school system to embark on special programs until the objectives have been clearly formulated.

A statement of objectives to be achieved at various school levels—primary through high school—has been agreed upon in a number of Wisconsin schools in which the author is conducting experiments. The following eight objectives guide evaluation of experimental arrangements for the gifted, including acceleration, special classes, enrichment in heterogeneous classes, and team teaching:

1. The children of superior learning ability in comparison with others are to acquire the subject matter more efficiently. Their more efficient acquisition of subject matter is to result in fuller knowledge and understanding of the physical and social world.

2. The children of superior learning ability in comparison with others are to develop better work-study skills, including learning-to-learn procedures. In turn, this should lead to a higher degree of independence in learning efficiency in and out of school.

3. The children of superior learning ability in comparison with others are to develop higher-level problem-solving abilities, sometimes stated as effective thinking, critical thinking, or reasoning.

4. The children of superior learning ability in comparison with others are to develop

higher-level expressive abilities in such areas as oral and written expression, art, music, dramatics, and physical activities.

5. The children of superior learning ability are to acquire appreciations of beauty in more fields than other children.

6. The children of superior learning ability are to develop effective citizenship behaviors as other children.

7. The children of superior learning ability are to develop adequate and good personal-emotional adjustment as other children.

8. The children of superior learning ability are to develop ethical conduct and character as other children.

Whether reaching these educational objectives will lead to desirable outcomes for the individuals in adulthood cannot be determined except through longitudinal study. And for clarification of what gifted persons themselves value at mid-life we turn to Terman's work.

The values expressed at mid-life by persons who were originally identified in the early 1920's as gifted children are noteworthy (Terman and Oden, 1959). Their responses to the question "From your point of view, what constitutes success in life?" were as follows:

a. Realization of goals, vocational satisfaction, a sense of achievement;
b. A happy marriage and home life, bringing up a family satisfactorily;
c. Adequate income for comfortable living (but this was mentioned by only 20 percent of women);
d. Contributing to knowledge or welfare of mankind; helping others, leaving the world a better place;
e. Peace of mind, well-adjusted personality, adaptability, emotional maturity [Terman and Oden, 1959, p. 152].

The above categories of responses were given by about 40 to 50 percent of the entire group of males and females, except for (c) as noted. If these are acceptable goals to be achieved by the age of thirty-five to fifty, then the more immediate objectives stated previously should contribute to their eventual realization.

Terman and Oden concluded their thirty-five-year follow up of gifted children with these words:

> We would agree with the subjects that vocational achievement is not the only—perhaps not even the most important—aspect of life success. To many, the most important achievement in life is happiness, contentment, emotional maturity, integrity. Even failure to rise above the lowest rungs of the occupational ladder does not necessarily mean that success in the truest sense has been trivial. There may have been heroic sacrifices, uncommon judgment in handling the little things of daily life, countless acts of kindness, loyal friendships won, and conscientious discharge of social and civic responsibilities. If we sometimes get discouraged at the rate society progresses, we might take comfort in the thought that some of the small jobs, as well as the larger ones, are being done by gifted people [Terman and Oden, 1959, p. 152].

Gifted high school pupils also indicate that they receive specific values from schooling. At the end of the first year in an honors class in American history, the exceptionally able high school juniors enrolled in it said that they valued most from the course (1) learning how to study, (2) learning how to secure reliable information and to write research reports, (3) having long-range assignments rather than daily, short ones, (4) participating in panel discussions, whole-class discussions, and debates, (5) reading documentary and current material, (6) forming of better reading habits, (7) learning to budget time, (8) gaining feelings of confidence when presenting information orally, and (9) having freedom from routine assignments, including the learning of large amounts of factual information in chronological sequence. These bright students, like Terman's adults, want considerable independence and respect as individuals, they want to feel secure with themselves and others, and they hope to contribute to the group. Undoubtedly, if asked why they valued the above, the students would reveal that their choices bore some relationship to their plans for later life—marriage and vocational success, for example.

Identification

Gifted and talented children are identified through use of standardized intelligence tests (also referred to as scholastic aptitude tests), standardized achievement tests, teacher observation, and other means of appraisal. Further, whether mental age, IQ, or scholastic aptitude scores are obtained from the tests, the tendency is to use some form of percentile score or other deviation score so that, regardless of test used, the lower limit is the same, e.g., 99th, 90th, or 75th percentile. The lower limit of IQ accepted by schools varies widely, from as low as 60th to as high as 99th percentile, and correspondingly wide variations are found in lower limits obtained from achievement tests and teacher judgments.

Two important considerations in studying the criteria by which to identify the gifted are: (1) the higher and more numerous the criteria which are set, the greater is the probability of having within the group classified as gifted a high percentage of those who will have high achievement as adults, and (2) the higher and more numerous the criteria which each child must meet to be considered gifted, the greater the probability of eliminating from the gifted group many children who will also contribute significantly to society as adults. The school system which sets the lower limits for IQ and achievement at the 60th percentile will miss only a small percent of pupils who will subsequently achieve high but will also have included many who will subsequently perform at an average level in many subject fields. The system which sets the lower limit of IQ at the 99th percentile and achievement at the 95th percentile will have identified the outstanding performers but will also have missed a large number of pupils who in adult life will make significant contributions.

Many schools are now setting the lower limit of IQ at the 85th and of achievement at the 75th percentile, intending to identify the top 10 percent or thereabouts. In some large city systems the criteria are purposefully varied among schools within the city. In schools which draw pupils almost totally from lower socioeconomic status, it is assumed that an impoverished environment will depress IQ and achievement scores in relation to those of other children in favored environments; therefore, the criteria are at times lowered in these schools.

Physical, social, and emotional maturity are also considered in identifying gifted children. As shown in Chapter 4, the difference between elementary school children of low (average IQ 67) and high intelligence (average IQ 127) in such physical measures as height, weight, number of permanent teeth, and bone development is of no practical significance for any educational purpose. Similarly, emotional adjustment was found to be about the same for the children of low and high intelligence. If a special educational provision is to be made for gifted and talented children, no child should be eliminated simply because he is below the average of all children in physical development or because he is less well adjusted socially or emotionally than most children (Klausmeier, 1959). It is possible that poorer social and emotional adjustment in a bright child might result because the instruction is not suited to his needs; if special provision were made, his adjustment might improve markedly.

Enrichment Within Heterogeneous Age-Graded Classes

The various means of individualizing and grouping children for instruction are intended to enrich or improve learning opportunities. The present discussion applies only to procedures in age-graded, heterogeneous classes formed on mechanical bases such as grouping alphabetically.

Enrichment procedures are applicable to many school situations. The small school that has only one first-grade class of twenty-five pupils can enrich instruction for the brighter ones, as can the larger school with ninety first-graders. Descriptions of enrichment procedures are manifold and are represented in articles by Pregler (1954), Dunlap (1955), and McWilliams (1956). In Milwaukee the purposes and means of enrichment applied generally to all school levels and subject fields are these:

> ENRICHMENT
>
> Enrichment is directly related to teaching techniques and the curricular program, rather than being an aspect of administrative organization. Enrichment activities in the classroom are those learning experiences that:
>
> Broaden the understandings or processes in a given subject area.
>
> Give the pupil increased power to deal with more difficult aspects of what the class is doing.
>
> Encourage experimentation and exploration in a particular area of study.
>
> Give opportunities to relate what is being learned to other fields and to everyday life experiences.

Many enriched learning activities in which bright children participate and lead are being conducted in Milwaukee's Schools. These include:

RESEARCH ACTIVITIES

Challenging questions and assignments in the areas of science, social studies, literature, arithmetic.

Extended reading in the special fields.

Reading varied and more difficult materials: magazine articles, editorials, news items, feature columns, historical and scientific materials.

Extended use of the public library: youth library, reference room, and other special departments.

Field trips in the community: museum, governmental agencies, business, and industry.

Finding new ways of solving mathematical problems.

Projecting research data onto maps, charts, graphs.

CREATIVE PROJECTS

Original writings: poems, plays, stories, newspaper articles, radio skits.

Oral and written reports on research topics.

Dramatic activities: plays, puppet shows.

Original arithmetic problems.

Science projects and displays.

Construction activities.

Art activities: murals, dioramas, clay modeling, stage sets, puppetry.

Wood and metal crafts.

EXPERIMENTATION AND DEMONSTRATION

Science experiments.

Mathematical demonstrations of new processes.

LEADERSHIP OPPORTUNITIES

Acting as chairman or announcer for auditorium programs.

Participation in panel or round-table discussions.

Membership on committees.

Participation in clubs and organizations.

Leadership in student government, athletic squads and teams.

CLUB WORK

Arts and crafts, stagecraft.

Hobbies and interest groups.

SERVICE TO SCHOOL AND COMMUNITY

Special duties as monitors: nurse, office, milk and lunch money collections, selling school supplies, projector operators, library monitors, stage crew.

Assisting with special projects: saving stamp sales, clothing drives, Thanksgiving baskets, Junior Red Cross activities, conservation projects.

SPECIAL TALENTS

Participation in instrumental music classes.
Membership in school orchestra, band, chorus.
Dramatics, dance.
Athletics.

[Milwaukee Public Schools, 1957, pp. 18–20]

In addition to the fact that enrichment can be done in the smallest to the largest schools, judgments favoring enrichment for gifted pupils in regular classes rather than grouping or accelerating include: (1) enrichment can provide for each child to develop his abilities to the fullest, (2) children of varying abilities and levels of abilities have opportunity to work and play together and benefit from these contacts with one another, (3) the less able pupils are encouraged by the presence of the more able, (4) this type of school situation more nearly parallels that outside of school, and (5) it is desirable for the more able pupils at times not only to live with but to help those of lower abilities. Some of the drawbacks to enrichment in the upper elementary grades and thereafter are (1) it is difficult to provide competent teachers who have sufficient knowledge in several subject fields to do a good job of enrichment, (2) there is insufficient time to work well with the gifted students, particularly in the junior and senior high school where the teacher has as many as 150 students daily, and (3) it is exceedingly difficult, if not impossible, to do a good job of enriching instruction without drawing subject-matter content from the next higher grade level. This last drawback is critical in connection with enrichment in heterogeneous classes, since most schools have not found adequate means whereby the bright fifth-grade pupils, for example, use regular sixth-grade textbooks while the more average and slower students use fifth- and fourth-grade texts, respectively.

Acceleration

In this discussion acceleration means that the students will finish twelve grades in less than twelve school years or, after finishing high school in twelve years, will receive college credit which permits completing the requirements for the baccalaureate degree in less than four years. The principal means of acceleration are early admission to kindergarten or first grade, double promotion, concentrating instruction in shorter time periods, lengthening the school year to permit graduation in less than twelve school years, early admission to college, and admission to college with advanced standing. Acceleration, like enrichment, can be applied from the very smallest one- or two-room rural school to the largest city school system. Further, much research shows favorable effects of accelerating gifted pupils.

EARLY ADMISSION TO KINDERGARTEN OR FIRST GRADE. One of the strongest cases for early admission to kindergarten, and subsequently to first grade, on the basis of mental age rather than chronological age is made by Worcester (1956). He studied the performances of children in later elementary grades whose average admission age was eight months younger than that of pupils admitted regularly. The pupils who had been admitted early were found not to differ in physical development from those regularly admitted. In academic work the younger did as well or better than their older classmates. As judged by their classmates or by teachers' ratings, they were as well or better adjusted socially and emotionally than the other pupils. They had as good or better psychomotor coordination, were well accepted by their peers, liked school, and did as well or better than those of the same age who were a year later in getting started to school. No negative effect of the early admission was noted, although some individual pupils were found not to have made good progress.

Observe that the children admitted early were only eight months younger than those normally admitted and were thus primarily drawn from the group which was born from a day to a few months too late to enter normally. However, had they not been admitted early, they would have lost a whole year except in schools which admit at the beginning of the second semester. Though the case for early admission is very strong, there are some inherent weaknesses. If some children are given individual intelligence tests and other tests in order to decide whether they may be admitted to kindergarten early, the entire child population should be. But when it is left up to parents who can afford or desire the testing, many other children who might also have been admitted early are not. As yet, few school systems are willing to spend about twenty-five dollars per child to give each preschool child an individual intelligence test and other needed appraisal.

A second difficulty is that our measures of intelligence for four-year-olds are known to be quite unreliable, much more so than for seven-year-olds. Finally, if the school has a reasonable program for accelerating children after they enter kindergarten or first grade, better estimates can be made of those who would profit most from it after they have entered school. Intelligence test results become much more stable at around age seven and, by that time, teacher judgments of performances in the school situation can also be used. The school system which has the needed money to test all children before the normal entering age of kindergarten (about four years, nine months) should consider the desirable possibilities of early entrance, particularly of those children who because of the month in which they were born just missed being allowed to enter by one to six months.

DOUBLE PROMOTION. Having the child skip a grade, from second to fourth or from sixth to eighth, for example, presents many difficulties and should probably not be practiced except in small rural or other poor schools which cannot provide more adequate means of acceleration. The disadvantage of double promotion is that the pupil often skips some important learnings which are difficult to accomplish in the next grade or which are never accomplished. Nevertheless, if a school has no better means of providing for exceptionally gifted pupils than through double promotion in order to permit the brighter student to graduate at seventeen and one-half instead of eighteen and one-half years, skipping may be desirable.

CONCENTRATING INSTRUCTION INTO SHORTER TIME PERIODS. Concentrating instruction into shorter time periods is more efficient than double promotion or skipping and offers opportunities not provided by earlier entrance into kindergarten or first grade. In the ungraded primary school the bright child can complete the normal first three grades in two years if the school is operating on a yearly plan, and in four or five semesters if it is operating on a semester plan. No skipping of instruction need occur. Similarly, bright students can finish three years of junior high school in two, or four of high school in three, or four years of college in three when arrangements are made to concentrate instruction into shorter periods of time, e.g., six semesters of algebra and geometry in four.

Acceleration by this and other means should be considered, particularly for those children who happen to be born from one day to several months too late to enter kindergarten and are therefore the older children in the class when they do enter. Bright children who thus were delayed in entering school should be accelerated so that they will complete high school when they are at least as young as children of average and lower abilities who happen to be born during the months that permitted them to begin the first grade at a younger age. This acceleration can take place at any time in the primary, intermediate, junior, or senior high school. To make it work well, the children of high ability who are above the median chronological age of children in the grade should be given careful appraisal at each school level. Difficulties are often encountered in accelerating through condensing instruction into shorter time periods if the teacher cannot provide the needed instruction for the few students within the class whereby they can accomplish the outcomes of the next grade. For this reason the lengthened school year and permitting most bright students to take courses for additional credits are advantageous.

LENGTHENED SCHOOL YEAR AND ADDITIONAL CREDITS. Bright children who might profit from acceleration are now being identified in the primary grades and intermediate grades. The teacher enriches instruction for them during the regular school term, and a short summer session is arranged for these children. For example, the bright learners of above median chronological age in the second grade are identified; they attend a summer session for a few weeks to learn whatever third-grade material they might need, and then enter the fourth grade in the fall. The same procedure may be used at any elementary school grade and, to some extent, in the junior and senior high school. Exceptionally bright children who are not above the mean chronological age can also be accelerated by this means, so that they finish high school before age seventeen. If parents, pupils, and school people could somehow be assured that every bright child who finishes high school at age sixteen or thereabouts would secure higher education, there would undoubtedly be more acceleration than at present. Most schools and parents prefer that the child remain in school an additional year rather than run the risk of his finishing high school and all formal education at age sixteen.

During World War II a considerable number of students finished four years of college in three years by such means as going regularly to summer school, receiving credit for courses by examination, and taking more courses than most students during each semester or quarter. Pressey and Flesher (1955) studied a group of such accelerated female students while they were in college and again ten years after they were graduated. Ten years after graduation a lower percent of the accelerated students had married and had children; however, they were a year younger than the control group. About the same number of accelerates and nonaccelerates were active in community affairs ten years after graduation; however, twice as many of the accelerates had earned a further academic degree and almost twice as many of the married accelerates were continuing in a career other than as housewives. Though the accelerates probably had higher motivation and ambitiousness originally, the general conclusion was that completing the four years of college in three had many desirable and no undesirable effects. Only women were included in the experimental and control group; it was hypothesized that the accelerated program might have been even more beneficial for males.

EARLY ADMISSION TO COLLEGE. Starting in the fall of 1951, tenth- and eleventh-grade students were selected and admitted early to twelve participating college and universities under an arrangement sponsored by the Fund for the Advancement of Education (1957). They simply "skipped" their last semesters of high school. After four years, as college seniors, those who had entered early in 1951 and in 1952 responded to some questions, as did a comparison group of the same scholastic aptitude admitted normally after high school graduation. The responses to some of the questions are shown in Table 13.1.

Those admitted early in 1951 were less favorable to the program than those admitted early in 1952; 42 percent and 75 percent, respectively, indicated that early admission was very profitable for them. Though only 12

TABLE 13.1. The Over-all Judgment of Scholars and Comparisons About Early Admission

RESPONSES BY THE SCHOLARS	1951	1952
Was early admission profitable in your case?		
Yes, very much so	42%	75%
Yes, with reservations	46	15
Neither profitable nor unprofitable	7	5
No, definitely not	4	3
No response	1	2
Would you advise a friend to enter college early?		
Yes, definitely	12%	27%
Yes, with reservations	75	61
Only in exceptional cases	8	5
No, definitely not	3	3
No response	2	4
Do you think the early-admission idea should become a regular part of the admission policy of American colleges?		
Yes, definitely	41%	66%
Yes, with minor modifications	31	15
Yes, with severe limitations	12	16
No, definitely not	15	2
No response	1	1
RESPONSES BY THE COMPARISONS (CONTROL GROUP)	1951	1952
Do you think acceleration of qualified students is wise?		
Yes, definitely	12%	32%
Yes, with reservations	67	44
Only in exceptional cases	11	10
No, definitely not	9	13
No response	1	1

SOURCE: *Adapted from Fund for the Advancement of Education, 1957, p. 62.*

and 27 percent of the accelerates would definitely advise a friend to enter college early, 41 and 66 percent indicated that early admission should definitely become a regular part of the admission policy of American colleges. The comparisons, control group, were considerably less enthusiastic, with 12 and 32 percent, respectively, thinking that acceleration of qualified students was definitely wise.

In the same report Farnsworth and his colleagues, after studying the social and emotional adjustment of the 1951 group, concluded that the adjustment to campus life was about as good as that of regular high school graduates and that the reasons for failure were about the same for the two groups. The recommendations of Farnsworth and his colleagues are especially noteworthy if early admission to college should become widespread. The more important were that (1) each student should be carefully selected on an individual basis for an individual college to make certain that the individual and the college are matched, (2) each student should be above average in academic achievement and of superior intelligence, (3) each student, except in unusual cases, should have completed the eleventh grade, (4) each student should show evidence of emotional maturity at least consistent with his chronological age, along with good ability in interpersonal relations and freedom from excessive parental pressure towards early admission, (5) students showing a history of misbehavior should not be admitted early and, if there is evidence of psychiatric illness, it should have immediate attention, (6) careful scrutiny should be given by large urban universities to students from rural areas. These recommendations imply that the students admitted early should be carefully appraised as individuals before being admitted and those admitted should not be treated as if they could get along well on their own without specialized help and guidance. Early admission to college in the future depends heavily upon the extent of acceleration before high school graduation and upon admission to college with advanced standing.

ADMISSION TO COLLEGE WITH ADVANCED STANDING. The practice of high school seniors' taking advanced placement tests in various subjects offered in college is expanding rapidly. Unlike the student who enters college without having completed all high school work, the advanced-placement student is graduated with other students at the end of the senior year but receives credit for course work in college. Also, some school systems are working out arrangements directly with colleges and universities whereby certain courses in high school are automatically accepted as equivalent to the same course in the freshman or sophomore year of college. Barnette (1957) described a program of advanced placement started at the University of Buffalo in the 1930's, and reported that desirable results have been achieved throughout the period.

The most difficult problem yet to be resolved in connection with early admission and advanced placement is that of cooperation between the high schools and institutions of higher learning (Meister, 1956). The Bronx High School of Science in New York City (a special school for the talented in science) and several others entered into a project whereby such courses as English literature and composition, biology, chemistry, physics, and mathematics were taught in high school as they supposedly are in colleges during the freshman or sophomore year. In eleven different subjects so offered, the same tests were administered to large numbers of high school seniors and college freshmen. The achievements of the seniors compared favorably with those of freshmen enrolled in various institutions. However, some institutions of higher learning will not credit these high school courses toward college graduation. Also, some colleges require much higher test scores than others before granting college credit. Besides these considerations, Meister reported that some college professors prefer that high schools offer no work in physics or chemistry so that they will not have to undo the lower school's poor teaching.

Though much greater cooperation between high schools and colleges, which would make advanced placement work better, is not an impossibility, the high school should provide the best education it can for its students and then encourage various colleges and universities to grant advanced credit if they so choose. It is unwise for the high school to offer the college courses if the intent and methods of instruction must be the same as presently found in many freshman and sophomore college subjects taught by graduate students. Further, there are often wide differences in two college courses with the same label. Introductory physics is not necessarily the same course in two colleges. In one it is a course that highly motivated students of above-average abilities can handle with reasonable effort; in another it is an unduly difficult course that only a small percent of the highly motivated students can pass with a grade of *C* or better.

In addition to these factors, the high schools cannot be assured that every student who might enroll in a course specifically designed for advanced college placement will eventually attend college. If some other content would be more appropriate for these students and equally appropriate for those who might enter college, this content should be emphasized in the high school. In any event, the arrangements for advanced placement should be worked out so that they benefit the student first. Whether the arrangement is particularly beneficial to either the high school or the college is much less important.

Shannon (1957) summarized a large number of research studies on acceleration and concluded that, if properly used, acceleration of gifted children does not handicap them personally or socially and that those who have been accelerated perform better or at least as well in scholastic work at all school levels as do their older and equally intelligent classmates. Acceleration is especially important in any form and at any school level for those who eventually enter professional careers. The student who enters college at age seventeen instead of nineteen will start his career two years earlier in teaching, medicine, law, accounting, and other professions. By the time he enters the career at twenty-one to twenty-five years of age, he will demonstrate physical, social, emotional, and intellectual maturity at least equal to those of his less able colleagues who are two to four years older.

Sectioning and Special Classes

Any school that has enough pupils for two sections can arrange them into a higher and a lower group. The school with as many as 150 or more students at each grade level can also section readily. If the high section contains only students of superior learning ability, it may be designated a special class for the gifted. The lowest section may be designated a class for slow-learning students. It is unfair to children, of course, to place them in these sections if they do not meet commonly accepted criteria of giftedness or slow learning. Unfortunately, some schools attempt to keep all sections equal in number, and this often determines the criteria used in placement in sections.

When sectioning is done in the larger elementary schools, the pupils receive instruction in most if not all subject-matter fields as sectioned groups. Some special groupings from among sections, for example, in music, art, or arithmetic, might produce more homogeneity. In the junior and senior high schools, the better procedure is to section students according to achievement level in particular subject fields, giving due consideration to pupils of high intellectual abilities and other criteria of identification.

If English, science, mathematics, and social studies are required of all students, the highest achievers in English are put together in the high English section, the highest achievers in science are put together in the high science section, and so on. Some students placed in the high English section are not placed in the high science section because they are not the highest achievers in science, and vice versa. The total number of all students in the high section in each of the four subjects is approximately twice as high as if each student had to meet the same achievement criteria in all four subject fields. Many students are in the top 15 percent in achievement in one or two subjects, a smaller percent in three, and a yet smaller percent in all four. When sectioning and related instruction are managed well in the high school, teachers and students of all ability levels are generally favorable to the arrangements, as shown in Table 13.2 (Klausmeier, Mulhern, and Wakefield, 1960). The small school (S) had an enrollment of 700, Grades 9-12; the middle-sized school (M), 1013; and the large school (L), 2160. The seniors in Schools S and M and the juniors in School L who responded were representative of the three ability levels in the schools. School M had the lowest proportion of students favorable to the sectioning into high, middle, and low sections; significantly it also had the lowest proportion of teachers favorable to sectioning, 75 percent. The high-ability students were most favorable, 50 of 54; the middle- and low-ability students were about equally favorable, 45 of 54 and 44 of 52, respectively. In the middle-sized school,

TABLE 13.2. Students' and Teachers' Responses Toward Continuing the Present Sectioning Arrangements in Three High Schools

School	Students' Responses						Teachers' Responses		
	High Ability		Middle Ability		Low Ability				
	Yes	No	Yes	No	Yes	No	Yes	No	No Response
S	18	0	17	1	17	1	18	1	3
M	15	2	11	6	14	3	30	3	7
L[a]	17	2	17	2	13	4[b]	25	2	2
Total	50	4	45	9	44	8	73	6	12

[a] Only teachers of eleventh-grade classes were invited to respond.

[b] Two students did not respond.

SOURCE: *Klausmeier, Mulhern, and Wakefield, 1960, p. 222.*

the middle-ability pupils apparently wanted to be in more high-ability classes. We also found that the students of all ability levels formed their friendships primarily on the basis of being in the same nonclass school activities rather than being in the same elective or required classes; thus the sectioning was not considered to have promoted undesirable social relationships among students in the three ability groups. The information in Table 13.2 should not be interpreted to mean that high school students and teachers in other schools might not be equally favorable to some other arrangements, such as heterogeneous classes with enrichment and no sectioning.

Special classes for gifted children, called the "major work program for gifted children," have been in operation for about thirty-five years in the public schools of Cleveland, Ohio. The program starts in the primary school, although some pupils are added during the intermediate grades. The pupils have most of their work in special classes, but take physical education, music, and crafts with the rest of their age-group classmates and participate in other regular school activities. As part of the enrichment program a foreign language is taught, although it is not offered to other children enrolled in the same school. Further, the enrollments, about twenty pupils per class, are considerably smaller than regular classes, thus permitting more individualization of instruction. Barbe (1955) administered a questionnaire to all the high school graduates of the program between the years 1938 and 1952. About 84 percent of these students expressed favorable attitudes about the special classes and more than 50 percent of both the men and women had no suggestions for improving the program.

The best-liked aspects of the program included foreign language, opportunity to express individuality, curriculum differences from regular classes, and freedom from regimentation. The least-liked features of the program were the somewhat unfavorable attitudes of other students and teachers toward the program and the lack of social contact with other pupils. The most frequent suggestion for improvement was that there should be more mixing or associating with other pupils. Other school systems report similarly desirable results for their special classes. As shown previously, equally desirable results are also reported for acceleration and enrichment in heterogeneous age-graded classes, particularly at the elementary school level.

Until recently special classes for the gifted in the elementary school have been operated primarily in large cities, for example, Cleveland. However, sectioning and special classes are common in junior and senior high schools which have enrollments of 150 or more pupils per grade. If special classes and sectioning are to work well in any school, differentiation of instructional materials and activities must be made in the various sections. Table 13.3 shows some features of the sectioning arrangements in the required English and history classes of the Waukesha Senior High School. The total enrollment in English is 644 and in history 666. The higher

TABLE 13.3. Features of Sections in Eleventh-Grade English and History, Waukesha High School

Section Designation	Number of Students Enrolled		Criteria of Selection in Both Subjects	
	English	History	Scholastic aptitude, local norms (Percentile Rank)	Achievement test, national norms (Percentile Rank)
Honors	24	25	90—higher	90—higher
One	262	264	60—99	75—99
Regular	264	279	18—59	25—74
Low Regular	74	78	1—17	1—24 Previous history of difficulty in the subject
Special	20	20	Individual appraisal	Individual appraisal
Total	644	666		

number in history results from more students failing the first time and repeating as seniors.

The juniors are invited to enroll in the Honors sections, provided their scholastic aptitude test score is at the 90th percentile or higher on local norms and their tested achievement in the particular subject is at the 90th percentile score or higher on national norms. Only four Honors sections are available, one each in English, history, mathematics, and science. Though some students are eligible for all four, most enroll in only the two in which they are most interested and enroll in One sections for the other subjects.

Students are given no choice in enrolling in the other sections for which they are eligible by the criteria. All students with scholastic aptitude at the 60th percentile or higher and in achievement in the particular subject at the 75th percentile or higher must enroll in the One sections. Teachers' grades and recommendations are given some consideration in admission to the Honors sections and to the Low Regular sections. The Special classes are for students identified as educable mentally retarded while yet in the elementary grades. Class size is lowest in the Special classes (20), about equal in the Honors and Low Regular sections (about 25), and highest in the Regular and One sections (about 30).

Other interesting features of the program concern reading materials and instructional activities. The required textbook is different for every sectional level. In the Honors section in history, for example, a book normally used at the college level and supplementary readings of documentary materials are used. In the Low Regular sections, a junior high school history book with a low level of reading difficulty is used; the same type of reading material is used in the Low Regular sections in English. However, in the Honors section in English, a regular high school text is used. The amount of writing activity goes up successively in all sections, regardless of subject, from Low Regular through Honors. The amount of assigned reading goes up successively from Low Regular through One; in the Honors sections the assigned reading drops off but is replaced with a heavier volume of voluntary reading. Objective tests are generally used from Low Regular through the One sections; in the Honors sections, almost no objective tests are used.

The most heterogeneous sections are the Regular, and the most difficult for which to find appropriate activities are the Low Regular. Publishers are just beginning to provide instructional materials for high school students whose reading achievements are at the junior high school level. Also, supplementary and general library books which have interesting content for students at about age seventeen have quite advanced vocabulary. The teachers at Waukesha are earnestly attempting to provide differentiated instruction in line with the level of abilities and achievements of the students in the various sections.

Many students in the One and Honors sections take little or no work in the fine and applied arts; however, this situation is being remedied somewhat in One sections through arranging sections in the fine and applied arts, instead of maintaining only heterogeneous sections. Some of these sections are semester-long rather than year courses; others are offered for two or three class periods weekly during the year, thereby permitting their greater availability to all students. Many students in the Low Regular and Regular sections of the two required subjects in Grade 11—English and history—are completing their programs of study in the fine and applied arts, and take only the minimum required work in the academic subjects.

Sectioning of able students permits both enrichment and acceleration. It is much easier to enrich instruction in a group that is relatively homogeneous in English achievements and interests than in a heterogeneous group with tested reading achievements ranging from eighth- to fourteenth-grade level. Similarly, it is far easier to condense instruction in mathematics into shorter time periods for thirty talented students enrolled in the same section than it would be if they were distributed in a number of heterogeneous classses.

Special Schools

Special public schools for bright children at the elementary school level appear completely alien to education in the United States, though a few private and public experimental elementary schools can serve a variety of research purposes. Special public high schools for the academically talented are also impractical in most communities. New York City, with its vast population and rapid transportation system, has four special high schools for students with varying talents in science, music, and dramatics. To set up comparable high schools for the academically talented in our less populated states would result in one for science in Iowa, another in Wisconsin for music, and a third in Minnesota for dramatics with the talented students from the entire high school population of all three states providing the student body of each separate school. These, of course, would be boarding schools, and it is doubtful then whether as large a homogeneous group could be brought together from the three states as is in the special schools of New York City.

Team Teaching

Team teaching has existed in the elementary, junior, and senior high schools to a limited extent for many years. Examples of more recent arrangements in team teaching are now discussed. Three junior high school teachers work with two groups of ninety junior high school pupils representing the entire range of abilities. They have one group in the morning for language arts and another group in the afternoon; or the team might be in mathematics and science or some other combination of subjects. For part of the instruction all ninety pupils may be kept together for a portion of the morning or afternoon, to listen to a lecture, to view a demonstration, to observe TV, and the like. For other portions of the half day, they may be grouped on the basis of interests, achievement level, differential abilities, friendships, and the like. In the elementary school the arrangement is similar, with three teachers—one especially good in science and mathematics, another in the expressive fields, and another in the language arts and social studies—brought together as a team. They work with a larger group, seventy-five to ninety pupils, as in the junior high school, keeping all pupils together for some instruction, and rearranging them into groups of varying size at times during the day to give them instruction suited to their abilities and needs.

The widespread experimentation with team teaching at the present time is concerned not only with improvement of instruction through better utilization of the strengths of individual teachers, but also with improvement of the teaching profession in general. The leader of each team is seen as a person committed to a career in teaching and therefore is rewarded financially. The members of the team are largely drawn from beginning teachers and internes, that vast number of persons who stay with teaching only for a year or two and then marry or go into some other occupation.

Still another team approach is appearing in the large, comprehensive high schools. With an enrollment of 1500 or more, the schools organize students into groups of about 200 to 300 on a variety of bases: mechanical, interest, achievement level, and the like. Each of these groups receives all its instruction from a group of about six to ten teachers. Supposedly, the students can achieve greater identity with the school and its instructional program, the teachers can know all the students in the group and thereby offer better instruction, and the possibilities for guidance and home–school relationships are improved. The team approach at any school level has possibilities for improving instruction for the gifted and talented, as well as other pupils, in that grouping can be accomplished readily to achieve desired outcomes in any subject field or expressive area.

SLOW-LEARNING AND MENTALLY RETARDED CHILDREN

Slow-learning and mentally retarded children comprise about 15 percent of the total child population of school age, according to criteria of IQ based on the Revised Stanford-Binet Scale. Slow-learning children have IQ's or scholastic aptitude ranging from the third to fifteenth percentile and equally low achievements in the usual school subjects. Some children with IQ's as low as 70 learn reasonably well and are properly classified as slow learners rather than mentally retarded, and some with IQ's as high as 75 who do not learn well are properly classified as mentally retarded. Dunn and Capobianco (1959) summarized some general agreements about terminology and definitions of mental retardation:

> Within the last six years, educators arrived at functional, though tentative, subdivisions of mentally retarded children. These categories are: (a) the "Educable mentally retarded," with IQ's of approximately 50 to 75, who appear to have sufficient potential to acquire skills in the basic school subjects; (b) the "trainable mentally retarded," with IQ's of approximately 30 to 50, who seem to have the capacity to communicate orally, to care for themselves physically, and to become economically productive in sheltered environments, yet who cannot be expected to become literate; and (c) the "custodial mentally retarded," with IQ's below approximately 30, who are unable to acquire skills even in self-help and thus require permanent care [Dunn and Capobianco, 1959, p. 453].

We now turn briefly to considerations of provisions for slow-learning, educable mentally retarded, and trainable mentally retarded children. The custodial mentally retarded are usually placed in residential institutions and remain there for life.

Slow-Learning Children

The provisions for slow-learning children are variable, depending upon the size of the school and the abilities of the staff. The general objective is to identify whatever abilities the slow-learning child possesses and to develop those abilities to the fullest. In the elementary grades slow learners are usually kept in the same heterogeneous classes with other pupils; special sections are arranged for them in some larger elementary schools. In the larger junior and senior high schools which have special sections or classes for gifted children there are usually special sections or classes for the slow learners also.

Nonpromotion of slow learners is more widely practiced than is acceleration of gifted students, with far more boys than girls not being promoted. What are the criteria for acceleration and nonpromotion? Holmes and Finley (1957) reported that reading vocabulary and spelling achievement are the most important determiners of whether a child is accelerated or not promoted. Equally important, achievement in reading comprehension, arithmetic fundamentals, and arithmetic reasoning is not related to promotion or acceleration. Boys as a group do not achieve as high in reading vocabulary and spelling as do girls; however, they do as well or better in arithmetic fundamentals and in arithmetic reasoning.

The above conclusions are in harmony with the vast amount of research which shows that holding back slow-learning children does not improve their achievements or help their adjustments to school in any way. Hall and Demarest (1958) reported the effect of a change in promotional policy on pupils' achievement in reading in one district of the Phoenix schools. The traditional basis for promotion was academic achievement; that policy resulted in a large number of bilingual and underprivileged children not being promoted. A change was made to continuous promotion, on the assumption that all the pupils would make continuous progress more readily by being promoted each year than by being kept back. Under the new policy some nonpromotion continued; however, the number of pupils not promoted was markedly reduced.

On the basis of achievement tests administered for ten consecutive years, abandoning the traditional policy in favor of continuous promotion did not result in lower reading achievement; on the contrary, slight improvement resulted for the entire group, including those who would have been kept back under the traditional policy. During the ten-year-period, the mean IQ of the entire child population each year varied from 91 to 97, well below national averages; and some children had IQ's below 85.

Goodlad (1952) reviewed many studies dealing with effects of nonpromotion on achievement and personal-social adjustment. Slow-learning children achieve as well and adjust somewhat better when promoted with their age-mates than when kept back. Undesirable growth characteristics and unsatisfactory school progress are more closely associated with nonpromoted than with promoted slow-learning children. Goodlad indicated that some slow-learning children may profit more from being retained with a sympathetic teacher than from being promoted to a class where the teacher is concerned primarily with subject-matter achievements and is less understanding of children who do not learn easily. He concluded that each child should be considered individually, and if there is any doubt that nonpromotion will lead to all-round development of the child, the child should be promoted to the next grade.

Teachers in the junior and senior high school frequently experience ethical conflicts within themselves when making a decision as to whether to maintain a minimum standard of achievement and fail the slow-learning student who has done his best or to pass him along even though he has not achieved a minimum standard set forth by the teacher or the school. There is no point in having slow-learning children attend high school classes if they do not learn so well as they might or if they continuously experience failure in many subjects. The better approach, psychologically and ethically, in providing for slow-learning students in high school is to arrange special sections for them, make certain that they learn as well as they can, and set up standards of achievement in terms of their abilities, not in terms of the entire high school population.

Education must help most slow learners to become relatively independent economically and stable emotionally and socially. Though an exceedingly wealthy country, the United States cannot look forward to supporting slower learners throughout life through tax monies or charities. Depriving them of further education at around age sixteen or not having them learn well in usual classes almost assures that a considerable number will never become economically self-sufficient. As will now be shown, a considerable number of educable mentally retarded children with special education eventually become independent of others, find employment, and make useful contributions to community life as adults in labor and service occupations.

Educable Mentally Retarded Children

In the more backward states and communities, educable mentally retarded children are institutionalized at a young age and remain wards of the state for the remainder of their lives. In some smaller and more isolated schools, mentally retarded children are kept in regular classes until they are hopelessly incompetent to perform the class work, at high school age if not earlier, whereupon they quit school and remain with the family or are institutionalized. In the more progressive communities and states the educable mentally retarded are identified at some time between kindergarten and fourth grade and are placed in special classes in a regular elementary school. As they are able to participate in the regular program of music, art, physical education, and other school activities, they do so; but their instruction in the usual school subjects is in the separate class. At about age sixteen they are placed in special classes and kept in them until ages eighteen to twenty-one, but receive vocational education; or they go to vocational high schools; or they are placed in other specialized vocational arrangements. By age twenty-one some assume rather complete independence and responsibility for their own adult lives. Some marry and have a successful home life; some subsequently have normal children, particularly the more attractive females and the occupationally successful males who marry mates of average abilities. Many others, however, though performing a variety of skilled, semiskilled, and unskilled tasks well, need a protecting environment in the home or elsewhere throughout adult life to help them with their social and economic affairs. Still others do not make a successful life and, by delinquency, criminality, emotional disturbance, or general incompetence, become permanent wards of the state.

The objective of education for mentally retarded educable children is to develop their abilities to the fullest. However, to expect the majority of them to achieve well in an algebra class, to read at ninth-grade level, or to understand abstract ideas well is unrealistic. And the related problem of family life and marriage is also a complex and involved one. Sex generally becomes a critical problem at adolescence, especially with girls. Though sterilization of some mentally retarded people is permitted in some states, it is frowned upon by some religious and ethnic groups, as is the encouragement of effective birth control. It is common to find mentally retarded children now enrolled in special classes whose parents were also enrolled in them as children. Some geneticists believe that it is probably better not to attempt state- or nation-wide sterilization of the mentally retarded, even of those carrying through several generations. Rather, since our United States is so wealthy, those of higher abilities can continue to contribute as necessary to the education and support of the mentally retarded. It should be clear that keeping the educable mentally retarded in the home and in special classes of the neighborhood schools tends toward more marriages and subsequent children than does institutionalization at a young age.

Trainable Mentally Retarded Children

The education of trainable mentally retarded children in special classes of the public schools, wherein the child attends school for a portion or all of the day and lives at home, is so recent that the outcomes are also highly tentative. Over a two and one-half year period, the author conducted research in some twenty-five different classrooms for educable mentally retarded children in two cities of Wisconsin and in four classrooms for the trainable. The enrollment is typically kept at eighteen or lower for the educable retarded, and at twelve or lower for the trainable.

The difference between the performances of these two groups at the same age is very sharp. Though a trainable child occasionally performs as well as one in the retarded group, at age ten most of the trainables cannot count ten pennies correctly, have difficulty with outer garments such as overshoes and buttons, and are exceedingly difficult to communicate with meaningfully. Simple quantitative terms, such as "faster" and "slower," "more" and "less," cannot be communicated to them at this age. If a small percent of them can become relatively self-sufficient with some supervision and make their own way economically as adults, the efforts of the teachers and the public in supporting the special classes are worthwhile. A considerable portion of them will need continuing help throughout life or, upon the breakup of their homes through death of parents or otherwise, will probably become wards of the state.

SUMMARY

More is known about differences among students than about making adequate provisions for them. Each school system, however, must accept the responsibility to identify and provide well for each student. Provisions must necessarily be varied according to such factors as the size of the community and the characteristics of the students enrolled in the school.

To provide well for students in group situations, some form of individualization or grouping in part of the instructional program is essential. Individualized assignments and activities, achievement-level grouping, and differential-ability grouping are better means of providing for differences among students in cognitive and psychomotor abilities than are identical assignments or activities for an entire class, mechanical grouping, friendship grouping, and interest grouping. The last named are, however, useful in achieving some educational objectives.

The particular provisions made for gifted, retarded, and other students should be based upon clearly stated objectives and reliable identification and selection procedures. Of the varied provisions for the gifted and talented, some form of acceleration and a variety of enrichment procedures are most applicable to schools of varying size, from kindergarten through college. Sectioning and special classes have been found more effective in the junior and senior high school than in the elementary school and in large rather than small schools. Special schools, attended only by the gifted and talented, are practicable only as experimental schools and in the largest cities.

Provisions for slow-learning children are also varied, depending mainly on the size and level of school. Educable mentally retarded and trainable children are increasingly receiving education in special classes.

QUESTIONS AND ACTIVITIES

1. (a) In your judgment, which of the eight generalizations about differences in abilities and general provisions are accepted least by the population generally?
   (b) Which generalizations do you think are least accepted by teachers and other persons in educational positions?
2. (a) Discuss each of the means of individualization proposed to provide for differences.
   (b) Which of these do you judge as most applicable to the subject-matter field and school level or other setting in which you are most interested? Give examples of possible applications.
3. (a) Give an example of each of the bases of grouping, applied to the elementary school, junior high school, or senior school.

   (b) Provide an example of each applied to a classroom setting.

4. Give your opinions of the ideas presented about the common elementary school and the comprehensive high school.
5. (a) Arrange the five responses of Terman's subjects at mid-life from most to least important in answering: "From your point of view, what constitutes success in life?"
   (b) Arrange the same responses from most to least important in answering: "Which of these should formal education help students achieve?"
6. Discuss the adequacy of the eight objectives used in Wisconsin schools.
7. Discuss the extent to which general intellectual ability, achievements, physical characteristics, and emotional adjustment are useful in identifying gifted children. talented children.
8. (a) Of the various means of enrichment outlined by the Milwaukee Public School staff, which are you capable of organizing and directing for gifted children within a heterogeneous class? Incapable?
   (b) Discuss the circumstances under which enrichment might work well in a school system. Poorly.
10. Describe the conditions under which each of the six means of acceleration might be better or more appropriate than the other five in providing for a gifted child. Refer to the Suggestions for Further Readings as necessary to secure further information.
11. Would you place students of high intellectual ability in the same sections or special classes for all high school subjects or would you section in each subject according to achievement level? Why?
12. Give your opinions of the Waukesha plan in high school English and social studies.
13. (a) If you had a child of your own who was a slow learner, what educational provisions would you want for him? If educable mentally retarded?
    (b) At what age or developmental level would you wish publicly supported education to cease for the child?
    (c) How often would you want the school to evaluate your child's abilities and progress?
14. State and discuss the main conclusions about nonpromotion. Use the cited articles as necessary.

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Chapter 14 New Settings and Contexts for Learning

In Figure 1.5 a behavioral setting for learning was described. Three components directly in the setting were treated: the learners with varying abilities and characteristics, the teacher or other person with abilities and characteristics, and the interactions and behaviors of the learners and teacher. The behavioral setting is arranged and managed in order to achieve educational goals.

Forces outside the setting were also shown to influence the learners, the teacher, and their interactions and behaviors. Among these outside forces are televised educational programs and recorded instructional programs, used with various electronic devices such as tape recorders and other machines. The students are expected to learn directly from these arrangements rather than from interactions with one another, the teacher, textbook, or other instructional materials. The more ardent proponents of television and machine instruction claim that each is a "major break-through" that will revolutionize and improve teaching–learning processes. But the principle underlying television instruction is opposite that underlying instructional programs with use of the tape recorder or teaching machines. Television provides the same instructional material or stimuli to large numbers; the teaching machine is designed to individualize instruction.

The goal of educational television as mass education is presented by Dunham, an ardent enthusiast:

> A determination to serve "all the people" from preschool to octogenarians, the glorious new generation of oldsters modern times now gives us, is the ideal of every single educational station. Good programs need not be expensive to produce; they are just hard to conceive and develop. Simplicity is a cardinal virtue in education, at all times, and necessity forces it on educational television. So the subjects of home life, travel, recreation, child care, reading, listening, resting, playing, the art of conversation, the arts of acquired skills in music, photography, design, and dance, play acting, participating in all forms of a "gainful occupation" as a person, become bridges that open up the gateways of the arts, the sciences, literature, philosophy, psychology, anthropology, and all the other subjects residing in the liberal education of today, produced by our educational institutions.
>
> Educational television is making them "come alive" for increased millions of

> viewers, who in the ease and comfort of their modern homes now may find an interesting new highway to the promise of an abundant life [Dunham, 1955, p. 617].

Another enthusiast describes the individualization possible with electronic equipment and related methods in foreign language teaching: "With automated teaching all the students can speak at the same time. With automated teaching all the students can speak all the time. . . . Every student has a private tutor. The rapid learner is not hampered by the slow learner" (Mathieu, 1959, pp. 6, 7).

One questions whether television or teaching machines should be used in foreign language, shorthand, or music instruction in a large school system. One teacher, providing a daily program on television which thousands of students view simultaneously, or the electronic equipment and a teacher in each of the 100 or more elementary school buildings? At present, some school systems are proceeding with television; others are using the electronic equipment. The decisions are often made on such practical considerations as availability of teachers and cost. If a school system already is equipped for television instruction, the cost is much less when instruction is handled through television. The electronic equipment is less expensive if the school is not equipped for television and if only a few school buildings are involved. Though the practical factors presently determine important educational decisions, it is unfortunate that we do not support the comprehensive research which might reveal which procedure produces most efficient learning of various outcomes in pupils of varying abilities and characteristics.

Psychologists and educators, concerned with the long-term effects and widespread usage of various educational media and devices, are concerned with research problems such as these:

1. Which human abilities and characteristics can be nurtured most effectively through which media and by which procedures? For example, can the ability to communicate effectively in a foreign language be nurtured as well in hundreds or thousands of students simultaneously viewing and responding to televised instruction as by use of electronic equipment, managed by a teacher, within each school building?

2. Is one or another medium or technique more effective in achieving certain learning outcomes than others? Is television equally appropriate for developing independence in problem-solving techniques and for presenting factual material? Is a teaching machine equally effective in developing citizenship behaviors and in conditioning persons to respond correctly to certain stimuli?

3. Is educational television equally appropriate for all age groups in all types of behavioral settings? For example, is television of most of the instructional program equally appropriate for first-graders in regular classroom settings under the direction of various teachers and for high school seniors or university students under the direction of one teacher?

4. How long will students of any age in any setting respond with sufficient motivation to the device to learn well? If a college should decide to offer an entire instructional program through the baccalaureate degree via television, how many students would remain in the program? What would be the effects of one TV course per semester? two per semester? Similarly, if the entire instructional program in a twelfth grade is offered by machines, will the students continue to learn, or even continue to use the machines, throughout the year?

Many other questions might be raised. These, however, indicate that much more research is needed. Equally important, the answers cannot be found unless the research is done, and this requires situations in which to do it. The military services have taken the lead in research, with use both of TV and of machines. But the age group and the setting in military life are different from those in most school situations and the results may also differ.

Wischner and Scheier expressed some points that are still applicable to TV instruction:

> . . . the relatively little research available, its character and findings, do not warrant the marked enthusiasm and overoptimism about educational television evidenced in many quarters. TV can teach, but the available data do not suggest that the medium as such provides any magical solution to educational problems. There are extensive gaps in our present knowledge about factors related to the effectiveness of television instruction.
>
> We need to learn more about the factors which make certain subject matters more suitable for television instruction than others. We certainly need information on the types of students for which TV is most effective in terms of aptitude and background characteristics. The available data on the aptitude variable are by no means unequivocal and very little is known about the background factors that may make an individual more or less receptive to television instruction. Reference was made earlier to indications that some instructors may teach well on TV, others may do relatively better in the regular classroom situation. It is clear, then, that we need to know more about how to select the best instructors for television teaching. Some may be of the opinion that the best classroom instructor makes the best TV instructor. This may not be the case [Wischner and Scheier, 1955, p. 613].

We know much more about TV than teaching machines, as will be shown in the remainder of this chapter, devoted to selected examples of: (1) television instruction; (2) electronic equipment and shorthand instruction; (3) electronic equipment and foreign-language instruction; (4) teaching machines; (5) team teaching. The primary purpose is to present an overview of some means of instruction or aids to instruction to which psychologists, educators, and teachers must give increasing attention.

TELEVISION INSTRUCTION

The two principal types of live television instruction are by closed-circuit and open-circuit, or regular, channel. Any live televised program may be recorded and transferred to kinescopes. The kinescopes, in turn, may be used as regular 16-mm sound moving pictures. A program in any instructional field may be televised in a studio, transferred to kinescopes, and the kinescopes made available to separate school buildings or other locations which have sound film projectors.

Closed-Circuit Television in One University

A comprehensive study of various instructional procedures, including closed-circuit television, was conducted at Miami University (Macomber and Siegel, 1960). It is one of the best longitudinal investigations completed to the present time. This entire section is devoted to it; the conclusions and other information are drawn directly from the study and include no interpretive comments by the present author. What follows is in highly condensed form.

PURPOSES AND SCOPE. The major purpose was to determine the relative effectiveness of large- and small-group instruction at the college level. Closely related purposes were (1) to improve large-group teaching procedures so that the claimed advantages of small-group instruction could be realized in large-group teaching to the greatest extent possible; (2) to study and improve facilities, including television, utilized in large-group instruction; and (3) to develop and encourage the use of a more adequate instructional aids center for the improvement of college teaching. Since the intent was to gain accurate information on the effectiveness of both large- and small-group instruction and of different teaching procedures and course organizations, rather than to substantiate any preconceived notions about methods of instruction or forms of class organization, evaluation was done from beginning to end of the study. The departments and courses involved in the study from February 1, 1955, to June 30, 1959, are shown in Table 14.1, together with the numbers of participating students.

DESIGN. The courses were taught under "experimental" conditions and under "control" conditions. The experimental conditions generally involved some variant of large-group instruction, with sections arranged in various ways to permit a single instructor to extend his influence as a teacher to a greater number of students than in the teaching of small classes. The control condition consisted of course sections which were "conventional" or "typical" in size for Miami University. A section was considered "large" if the instructor was responsible for at least twice the number of students ordinarily taught by him in a conventional section. Since the typical enrollment in a conventional course section at Miami University does not exceed 25-35 students, sections which enrolled in excess of 50 students were usually designated as "large." As a rule, however, sections classed as "large" had enrollments in excess of 80 students.

Four different types of large-group procedures, experimental sections, were investigated:

TABLE 14.1. Courses Included in the Study of Instructional Procedures

Course Title	Feb.–June, 1956				1956–1957				1957–1958				1958–1959			
	Expt'l.		Control		Expt'l.		Control		Expt'l.		Control		Expt'l.		Control	
	No. Sec.	No. Stud.	No. Sec.	No. Stud.	No. Sec.	No. Stud.	No. Sec.	No. Stud.	No. Sec.	No. Stud.	No. Sec.	No. Stud.	No. Sec.	No. Stud.	No. Sec.	No. Stud.
TV COURSES																
Foundations of Human Behavior	1	103	2	74	1	192	1	32	1	195	1	35	1	205	1	42
Principles of Human Physiology	1	96	1	31	1	198	1	33	1	228			1	175		
Introductory Sociology	1	141	4	144												
Human Biology	1	183	1	178												
Air Science I					1	154	1	35	1	119	1	20				
Principles of Economics					1	175	1	30								
Principles of Animal Biology									1	155	1	84	1	175		
American Government													1	61	1	78
LC COURSES																
Business and Government	1	119	1	35	1	125	1	35	2	199						
Composition and Literature	4	200	4	100	4	224	4	106	4	182	4	113	2	83	2	55
Essentials of Geography	3	213	3	93	3	225	3	105	2	232	1	29	1	103	1	24
Elementary Psychology	1	78	1	30	1	98	1	30	1	122	1	34				
General Chemistry					1	225	1	20	1	207	1	29				
Classical Humanities					2	132	2	60								
Principles of Economics					1	175	2	65								
Teaching Principles and Practices (Elem.)					1	50	1	25								
Teaching Principles and Practices (Sec.)					1	60	1	25								
Beginning French					1	46	1	25								
Second-Year French									1	48	1	27				
International Politics					1	60	1	30								

Course Title	Feb.–June, 1956				1956–1957				1957–1958				1958–1959			
	Expt'l.		Control		Expt'l.		Control		Expt'l.		Control		Expt'l.		Control	
	No. Sec.	No. Stud.	No. Sec.	No. Stud.	No. Sec.	No. Stud.	No. Sec.	No. Stud.	No. Sec.	No. Stud.	No. Sec.	No. Stud.	No. Sec.	No. Stud.	No. Sec.	No. Stud.
LC COURSES (CONTINUED)																
College Algebra					2	120	2	60								
Marketing Policy					1	60	1	30	1	40	1	24	1	30	1	18
Introductory Physics					2	92	4	80								
Essentials of Western Culture					2	170	2	70	1	80	2	64	1	104	2	60
Introductory Sociology					1	75	2	60								
Principles of Animal Biology					4	680	1	64								
American Government									1	70	1	28				
Accelerated Composition and Literature													2	92	2	56
INDEPENDENT STUDY																
Growth of American Civilization													1	26	2	68
International Politics									1	31	1	27				
GS COURSES																
Principles of Business	16	400	1	25	11	330	6	180	16	441	1	31	15	380	2	54
General Geology	5	120	1	21	5	150	1	30	6	212	1	39	7	264	1	23
Composition and Literature													4	109	2	55

Source: *Macomber and Siegel, 1960, p. 9.*

1. Sections taught by closed-circuit television, designated simply as TV courses.
2. Large sections, designated LC, in which the instructor was physically present in the room. These include courses taught by means of some variant of the lecture or interrupted-lecture method and courses taught by the case or problem procedure.
3. Independent study (IS) sections, wherein the number of scheduled formal class meetings was reduced below the usual requirement of one meeting per week for each hour of credit.
4. Sections taught by graduate student assistants (GS).

The control sections for the TV, LC, and IS courses were conventional classes consisting of twenty-five to thirty-five students. These sections were taught by the same instructors responsible for the experimental sections of a particular course. Thus, the basic type of comparison of student achievement and attitude was a comparison between criterion scores obtained under experimental and conventional conditions. Since many of the analyses required comparisons between data obtained from experimental and control sections, students were matched in all courses on the basis of various standardized tests. Also, a brief pretest of subject-matter knowledge was administered in a number of courses, and the experimental and control sections of virtually all courses were demonstrated to be equated with respect to proportional distributions by sex and class standing.

Evaluative instruments were developed in the areas of student achievement, student attitudes and opinions, and faculty attitudes and opinions. The measures of student achievement were course examinations; tests of synthesis, problem-solving and critical thinking; and tests of stereotypes and misconceptions. The student attitudes measured were those toward large-group instruction and toward the course and the instructor.

Various questionnaires concerning the relative strengths and weaknesses of the experimental procedures were submitted to the participating instructors. In addition, an open-ended type of questionnaire concerning large-group instruction was distributed to the entire faculty in the spring of 1959.

RESULTS. The principal results as applied to TV classes are now given in abbreviated form. Differences significant at or beyond the .05 level are reported. This level of significance means that there are 95 chances in 100 that the obtained difference is a true, not a chance, difference.

1. With few exceptions, in large-group instruction (including TV) subject-matter achievement as measured by course examinations was as high as in small-group (conventional) instruction. Of 28 comparisons between TV and conventional classes, only four differences were significant at or beyond the .05 level and three favored conventional classes. Of 45 comparisons

between large (not TV) and conventional classes, three of four differences significant at or beyond the .05 level favored conventional classes.

2. The experimental procedures did not lead to reduced proficiency in achievement defined as the ability to solve problems and to synthesize information. Of 22 comparisons between large classes, including TV, and conventional classes, only five were significant at or beyond the .05 level; all five favored conventional classes.

3. Subject-matter retention after periods ranging from one to two years, measured by using the same type of objective final examinations as at the end of the course, was unaffected by increased class size or by instructional procedure.

4. Students in the TV and in the large nontelevised sections rated the course content somewhat less favorably than did students in the control sections of these same courses.

5. Student motivation and interest in the specific subject matter were not adversely affected by assignment to experimental rather than to control sections.

6. The students, with few exceptions, judged the experimental procedures to reduce the instructor's effectiveness somewhat. This perceived reduction in teaching effectiveness was not paralleled by a corresponding decrement in actual achievement of students in the experimental sections as shown in the previous statements, 1-3.

7. Students in most courses preferred small classes to both large classes and TV classes. In total preference, not simply of the content or the instructional procedures reported in (4) and (6), the students in all 27 comparisons favored conventional over TV courses. And in all 29 comparisons they also favored conventional to large classes.

8. The instructor himself is a major determinant of student attitudes about TV and large-class instruction. There was a pronounced tendency for students to react either favorably or unfavorably to both their instructor and large-class procedures. The majority of students consistently indicated that they would enroll in a TV class or a large class (even though they preferred small classes) if they would be assured thereby of being taught by an excellent teacher.

9. Practically all instructors who tried TV teaching liked it better than they thought they would. Although most would still prefer to teach conventional classes, there was considerable feeling that TV classes are superior to other large-group teaching procedures. The major defects inherent in TV, as far as the instructors were concerned, are related to the physical barrier between student and teacher and the lengthy preparation time required for each TV presentation.

The reactions to TV of faculty members who did not try TV teaching are probably best described as "moderately favorable." About one-third of this group believed that televised instruction has a definite place on the campus for course work. Another third felt that TV should be used primarily for off-campus instruction and for supplemental work on the campus. The remaining third either felt that televised instruction should be abandoned (11 percent) or were uncertain about its place in the University setting (15 percent).

Some concluding comments of Macomber and Siegel about television teaching are of significance:

> Television is an effective means of communication for instructional purposes. The costs for purchase and maintenance of equipment and for course production are high; consequently TV teaching is not economical except as a mass medium. In general the cost factor makes televised teaching feasible only for courses of fairly large enrollment. Costs are quite variable, depending upon such factors as the kind and type of studio equipment purchased, open- or closed-circuit instruction, and the salaries and load credit for professional and technical personnel involved in course production. The "break even" point for this university is between 250 and 300 students enrolled in a given course at a given time. The ultimate use of video tape will, of course, materially affect the problem of optimal enrollments. It will increase the original cost of a lesson production considerably, but will make repeat performances possible at greatly decreased costs. The use of tape will add a very desirable degree of flexibility in scheduling courses and, consequently, add greatly to the utility of television as a medium of instruction.
>
> Possibly the greatest handicap to large group teaching other than the lecture method is, on most campuses, the lack of rooms planned to facilitate those procedures which are dependent upon class discussion. The lack of rooms designed for TV reception is of equal concern. The conventional class room with its bank of windows along one side, its overhead direct lights, and generally poor acoustical properties makes a very inadequate TV receiving room. Poor seating arrangement for TV viewing, the difficulty of eliminating receiving set glare, poor acoustics, and generally poor ventilation when shades must be used, puts TV teaching at a great disadvantage over the small group instruction for which the rooms were designed.
>
> The conventional rectangular room, even though of sufficient size to accommodate 60 to 80 students, normally discourages anything but a lecture, or at the best, an "interrupted lecture" as the basic teaching procedure. Auditoriums, while often excellent in acoustical properties and in ventilation, are not at all conducive to the development of class discussion. . . .
>
> Another serious handicap to televised teaching is the lack of receiving sets of adequate screen size and of picture quality needed for class viewing. This is a technical problem which is being increasingly recognized by manufacturers of receiving sets, and as the demand increases, it is expected that special classroom receivers can and will be designed especially for this market. The average commercial receiver, designed as it is for the home receiver market, is inadequate for instructional use, even when provided with special control and safety gadgets. Research is needed to better identify classroom needs so that TV receivers may be developed especially to meet these needs [Macomber and Siegel, 1960, p. 5].

Midwest Airborne Television Instruction

Some 570 public school systems and 117 colleges and universities used television to some extent in their regular instructional program in 1958-1959.

Thus, some part of the total instructional program was televised to less than 2 percent—about 500,000—of the total school enrollment. Now follows a brief description of a project intended to expand television instruction rapidly. The material is taken from oral and unpublished sources, including one of the members of the project. No evaluative comments are provided here. If the project is participated in by a reasonably large number of schools and colleges and if other arrangements prove satisfactory, similar projects may be initiated in other regions of the country. As you read, imagine what success in this project might mean to underdeveloped and populous countries of the world in which illiteracy is high, and also to countries which might wish to develop and use the same propaganda material simultaneously in all their schools.

The Midwest Council on Airborne Television Instruction is comprised of ten members and seventeen advisers. They outlined a bold and imaginative program of television instruction, with the transmission of programs to cooperating schools from an aircraft. The estimated cost to prepare for and conduct the instruction for the first year, 1960–1961, was about $7,000,000. Private gifts and grants from philanthropic foundations, industrial corporations, and others provided the initial funds.

Programs are transmitted from ground-based facilities at Purdue University to the aircraft, flying over the north-central part of Indiana. The aircraft is used in order to increase the range of transmission, making the programs available in a six-state region to schools and colleges which wish to participate. In this region are about 5,000,000 students enrolled in about 13,000 schools and colleges. (At the time of this writing, the number which participated during the first year is not known.)

The aims of the project are comprehensive, the main one being to provide better quality of education on an economically feasible basis to the rapidly increasing school and college population. The more specific objectives are to:

Give students educational experiences which often are beyond the scope of conventional means of instruction; for example, demonstrations involving costly laboratory equipment, via television, which might not otherwise be available.

Broaden the curriculum of the smaller schools which are unable financially to offer as complete an educational program as they would like; for example, by giving instruction in foreign languages, advanced algebra, sciences, art, and music.

Enable the classroom teacher to devote more time to individual learning needs of students.

Enhance still further the skills of classroom teachers by coupling with their talents and personal contacts the additional resources of an outstanding television instructor.

Allow a larger number of students to benefit from such added learning resources.

Help stretch the available school dollar still further and at the same time improve the quality of instruction.

The intent is eventually to telecast as many as 72 half-hour lessons during each of 144 school days. Most of the courses, organized into 30-minute lessons, will be on video tape. In this connection, one function of the Council is to recruit the necessary television teachers and produce courses on video tape for telecasting from the aircraft.

Besides producing the tapes, the project requires many other related activities. Special texts, study guides, and other materials are prepared for use with the television courses. Assistance is given to classroom teachers in making maximum use of the televised instruction as part of their own instruction. The schools and colleges which volunteer to participate are helped in evaluating the results. Though the school system is thus not bearing a large portion of the costs at the start, each school, except a few trying out noncommercial receiving sets, will equip their classrooms with conventional UHF receiving sets and make other needed arrangements for good reception of the programs. The Council does not foresee television instruction as eliminating the need for good teachers in the classrooms, but as making their efforts more productive.

SHORTHAND INSTRUCTION WITH ELECTRONIC EQUIPMENT

The use of electronic equipment in shorthand instruction is a technique of recent origin that holds high promise for making significant contributions to efficient learning of shorthand.[1] The same is true of electronic equipment in the learning of foreign languages. An experimental program in shorthand and another in foreign language are now described to illustrate what some persons are calling automatic or automated teaching, which may be applied to many fields. It is entirely possible that this type of electronic equipment will eventually be used as widely as TV or teaching machines.

The learning of shorthand may be divided into three major phases. The first is devoted to recognizing the shorthand symbols, developing facility in reading shorthand, and beginning to write from dictation. In the second phase the student takes dictation at increasing rates from unpracticed material, transcribing it back into longhand with reasonable accuracy. In the third phase the student acquires proficiency in taking office-style dictation and accurately typing transcripts from the shorthand notes. It is impossible to fix absolute lines of demarcation between these phases. However, the second phase is the one during which the electronic devices are used most advantageously.

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[1] Most of the ideas in this section were provided by Prof. Russell Hosler and Miss Ellen Lensing, of the University of Wisconsin, who devised the instructional program, did the first experimentation, and will publish complete results.

Some Problems in Developing Writing Speed

The second phase of shorthand instruction is concentrated in the second semester of the first course in high school. During this semester the student should spend the major portion of his time writing shorthand from dictation at speeds which challenge his best efforts. This raises problems for the teacher. If he dictates at a high speed, appropriate for the more proficient students, he inevitably thwarts the less proficient who cannot keep up. A common tendency is to dictate at a speed appropriate to the middle group, a speed inappropriate for both the more and less proficient individuals.

Experimental procedures and equipment have been devised to solve these problems. Dictation, recorded at varying speeds, is available to students in the same room via earphones. This procedure makes it possible for each student, without interruption, to select a speed appropriate for him, simply by turning a knob. The teacher is free to observe the class. All dictation can be stopped with a master switch, and whole-class discussion, practice, or any other classroom activity may be undertaken.

Description of the Equipment

The entire equipment, multiple-channel tape-teaching equipment for shorthand, is designed to make more adequate provisions for differences in learning rates among students and to make more effective use of the teacher's time. The procedure and equipment may have other uses in shorthand, including providing opportunity for students to learn independently outside the regular class period. The remaining discussion is devoted to classroom applications.

The electronic equipment consists of (1) four two-track tape recorders, a listening station for the teacher, and storage space for tapes, contained in one main control unit; (2) a control box on each desk, consisting of a channel selector switch, a volume control, and earphones whereby each student listens; and (3) a monitoring device which enables the teacher to hear the taped material which each student is receiving.

Prerecorded tapes, prepared at varying speeds of dictation, as well as *preview sheets* for each recorded program, are also necessary. Two programs are recorded on each reel of tape, one program to a side. Two hundred programs, dictated at speeds of 50 to 130 words per minute, provide sufficient material for each student in the class to write new material each day. The *preview sheets* are duplicated lists of the more difficult words and phrases in the dictated material. Each word or phrase is presented along with the correctly written shorthand symbols. About ten words and phrases are previewed for each minute of dictation.

Pattern of the Taped Dictation

The material for the taped programs is selected primarily from business letter material and is counted into short segments, easily dictated at varying controlled speeds. The exact pattern of one tape-recorded program with segments of 70 words and at a starting speed of 60 words per minute follows:

1. The letter is identified and the speed of dictation given so the student may be sure he has the proper preview sheet.
2. The student is instructed to "preview" the words for Segment 1; i.e., make sure that he can write the 8-12 words and phrases given on his preview sheet.
3. About 30 seconds of silence on the tape permits the student to complete his preview before he is asked to get ready to write at 60 words per minute.
4. The first segment of 70 words is dictated at 60 words per minute.
5. The student is asked to "postview," to review the words given on the preview sheet and ask the teacher about any others he did not know how to write.
6. Twenty seconds of silence allows time for the postviewing before the student is asked to get ready to write at a speed of 70 words per minute.
7. The same segment of 70 words is dictated at 70 words per minute.
8. Another 20 seconds of postview time follows before the student is alerted to write at 80 words per minute.
9. The same segment is dictated at 80 words per minute.
10. Steps 2 through 9 are repeated, using the second 70 words of the counted material.
11. The student is allowed 30 seconds to postview the material in *both* Segments 1 and 2 and then is asked to write *both* segments dictated together at the middle speed of 70 words per minute.
12. Steps 2 through 11 are repeated for Segments 3 and 4 of the copy.
13. Steps 2 through 9 are repeated for Segment 5.
14. Finally, about 30 seconds are allowed to postview all five segments. Then the entire letter is dictated at the *middle* speed of 70 words per minute; this takes 5 minutes of dictation time.

The above sequence of the taped instructional program is the same as that followed by the teacher without electronic equipment. However, the timing has higher precision, there is less possibility of interruption, each student may proceed at a rate most suitable for him, and the teacher does no dictating during the class period.

Using the Taped Dictation

The daily class procedure is similar to that which teachers normally use in a second-semester shorthand class—checking of homework, assignment of tomorrow's lesson, review of special points of theory or mechanics of English, testing, and warm-up dictation. When the time comes for speed-building dictation, the teacher simply asks the students to select their channels and follow the taped instructions. He starts the tape recorders and then is free for other instructional duties. The time devoted to the dictation activity varies from day to day; usually one-half to three-fourths of the period is devoted to it.

While the students are writing from the recorded dictation, the teacher may plug in his portable monitor and move about the room to observe the work of students, answer questions, suggest improved techniques, or otherwise guide the student. One student may be encouraged to try a faster channel; another to work at a slower rate. About three minutes before the end of the class period, all tapes are stopped and equipment is put away for the day. The student technicians and file clerks now take care of the equipment and other material.

Evaluating Student Progress

The basis for evaluating student progress with the machines is much the same as without them. The progress of a student is usually judged by the speed at which he takes dictation and transcribes it into longhand with a specified degree of accuracy. Only the transcript is checked. Errors are charged for omission of words, addition or change of words, misspelling, faulty punctuation, wrong homonym choice, etc. The prerecorded tapes have an advantage in evaluation in that it is possible to dictate many more transcripts during a class period, thus providing tests for a far wider range of abilities than a single dictating voice could.

It is reasonable to expect that this equipment and related procedure make possible more rapid development of able shorthand writers and simultaneously enable the average and less proficient to develop usable skills. The preview sheets that provide the models for the more difficult forms, the controlled rate of dictation, the repetition of segments in a progressive part-whole arrangement, the variable speeds to suit each learner, and the spaced practice are desirable applications of the principles discussed previously in Chapter 8 to facilitate the learning of skills. Further, the teacher, not having to spend any part of the class period in dictating, can help individuals reinforce correct forms and overcome errors.

FOREIGN-LANGUAGE INSTRUCTION WITH ELECTRONIC EQUIPMENT

The natural way to learn a language is by living in the environment in which the language is heard and spoken.[1] All other methods of learning a language are artificial; a behavioral setting is created in which the student hears and responds in the "foreign" language.

A native language is acquired in stages. First comes the listening period;

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[1] Most of the ideas in this section were provided by Sanford Couch, instructor in Russian at the University of Wisconsin. This language laboratory and related instructional program in Russian has been in operation since 1957.

speaking is the second. The third and fourth stages of language development manifest themselves through education. The child learns to read and write. Through orthography, the child learns to record human speech. Not everyone passes into the third and fourth phases of language learning, but individuals of every culture engage in the listening (comprehending) and speaking phases of language. It is for the student who is studying a foreign language with intentions of developing aural-oral skills that the electronic laboratory is arranged.

Problems in Foreign-Language Teaching

The development of aural-oral skills in an efficient manner demands close observation and direction from the first day of instruction. In the native environment, a child has at least one full-time language teacher, his mother or another older person. His pronunciation, sentence structure, etc., are closely supervised. He develops linguistic habits and his progress depends in part upon his individual abilities and skills and in part upon the persons imitated.

One teacher cannot listen to and correct individual oral utterances of thirty students simultaneously. But the individual student cannot be left unsupervised; he is in the most critical period of language learning. He must form correct speech habits. If he does not learn to pronounce words and utter phrases correctly, he will not be understood.

Each language has its own distinctive sound patterns. The language student must be educated to form these new sounds physically and to recognize these new sounds acoustically. The electronic language laboratory provides for individual supervision by the teacher in the development and perfection of aural-oral skills at rates appropriate to the individual student.

Description of the Electronic Language Laboratory

At the University of Wisconsin a classroom was converted into an electronic language laboratory. The desks were replaced by thirty individual booths, arranged in four rows. The booths are separated by acoustic wall board. The Instructional Control Center (ICC) table is positioned at the front of the classroom next to the blackboard.

Each booth and the ICC table is equipped with:

1. An electronic magnetic tape recorder. Each recorder can record, play back, or erase a two-track magnetic tape.
2. A set of earphones. The earphones, not detachable from the recorder, are equipped with approximately 2½ feet of cord. They are suspended from a hook, mounted on the side of the booth, when not in use.
3. A microphone. Each microphone is mounted on a flexible base which can be adjusted by the student.
4. A recording switch. This recording switch is open while the student

listens to the "live" or prerecorded voice through his earphones and is closed for recording his own voice. This reduces the background noise that might otherwise be heard during playback. The student hears his own voice through the earphones as he records, providing immediate feedback and the possibility of correction.

5. A reel of magnetic tape. This reel of magnetic tape is left on the machine and used by each class. There is no need to erase the tape after each class period; the machine when recording automatically erases any previously recorded material.
6. A speed control switch. This speed control switch permits the tape to be run at two speeds: 3¾ or 7½ rpm.
7. Tape index counter. This counter is used to locate recorded material on the tape.

Each booth is wired so that each machine can be turned on and off individually and so that the prerecorded or the "live" voice from the ICC table can be heard through the earphones and/or recorded on the student's booth tape. At the end of each row of booths is a monitoring box. The teacher can monitor individual booths from these monitoring boxes, using a portable set of earphones.

Classroom Procedure

The procedure varies, depending upon the lesson plan for the day; but a general plan is now presented.

INTRODUCING NEW MATERIAL. Within each new lesson, new grammar and new vocabulary are introduced. At the beginning of the class period mimeographed sheets on which are printed sentences containing this new vocabulary and illustrating the new grammatical structures are distributed. The student hears each sentence as recorded on the tape, and repeats it during a pause on the tape. Each sentence is heard and repeated three times.

An entire group of sentences is completed in about 8-10 minutes. This group is repeated three times. During the last 15 minutes of the class period, the grammar is explained and further examples, printed on a second sheet, are discussed. An assignment, made at the end of the hour, requires the student to translate a group of English sentences before the next class meeting.

DEVELOPING COMPREHENSION. After a short reading exercise has been translated and understood by the students, it is played at the normal speed of 3¾ rpm. The student has a copy of the text and follows it through three or four times. Then the speed of the tape is increased to 7½ rpm, and the student listens to this three or four times. At the increased speed the voice is distorted but comprehensible. Thus, the same material is given in much less class time, and the difficult areas are brought into focus. The tape is then run at 3¾ rpm, and the student carefully follows the printed material. Finally, the student listens three or four times to the same material without using the printed text.

DEVELOPING ORAL SKILL. The student selects a tape on which has been recorded a series of sentences containing familiar vocabulary but common expressions which he has not yet learned. Here is an example of a sequence for one new phrase:

Time	*Voice*	*Phrase*
5 sec.	English	"You must write this letter before tomorrow"
10 sec.	Pause	Student attempts to express this in Russian
5 sec.	Russian	"YOU MUST WRITE THIS LETTER BEFORE TOMORROW"
10 sec.	Pause	Student repeats phrase in Russian
5 sec.	Russian	"YOU MUST WRITE THIS LETTER BEFORE TOMORROW"
5 sec.	Pause	Student repeats in Russian
5 sec.	Russian	"YOU MUST WRITE THIS LETTER BEFORE TOMORROW"
5 sec.	Pause	Student repeats in Russian

Each sequence takes approximately 1 minute. After each set of phrase sequences, the preceding sentences are heard and repeated three times at 5-second intervals, a total time of about 1½ minutes. The class hour is divided into the following schedule:

Sequence	*Time*
1st set of phrase sequences	3 min.
Review of 1st set	1½ min.
2nd set of phrase sequences	3 min.
Review of 1st, 2nd set	3 min.
3rd set of phrase sequences	3 min.
Review of 1st, 2nd, 3rd sets	4½ min.
4th set of phrase sequences	3 min.
Review of 1st, 2nd, 3rd, 4th sets	6 min.
5th set of phrase sequences	3 min.
Review of 1st, 2nd, 3rd, 4th, 5th sets	7½ min.
Review of 1st, 2nd, 3rd, 4th, 5th sets	7½ min.
	45 minutes

Evaluation of Student Progress

The student can and should help evaluate his own progress. The electronic language laboratory provides for objective evaluation:

1. Each student is assigned a small reel of magnetic tape at the beginning of the term.
2. Each time a new lesson is introduced, the student puts the assigned tape on his booth machine and reads the new material into his own reference tape. Before recording, he sets the index counter at "000"; after recording, he notes the number of the index counter on the label of his reference tape, rewinds the tape, and returns the reference tape to the assigned shelf in the lab.
3. When the lesson has been "mastered," the student again places his refer-

ence tape on the booth recorder, sets the index counter at "000", winds the tape to the number he previously indicated, and at that point begins recording his reading of the "mastered" material.

4. When he has finished this second recording, he rewinds the tape and listens to the "before" and "after."

This self-criticism provides an answer to language students who feel they are not making progress in their study of the foreign language, but who are in fact making excellent progress. Listening to such a recording reassures some that their labor is bearing fruit. The results also reveal to the lethargic student that he is not making progress.

It is physically impossible for one teacher to supervise the individual responses of twenty-five to thirty students; the electronics language laboratory provides a satisfactory substitute. The procedures outlined in this section represent only a few of many approaches which can be developed and applied.

TEACHING MACHINES

The teaching machines discussed in this section are automatic or partially automatic devices which present a question or other stimulus to a student, provide a means for the student to respond, and then inform him of the correctness of his response immediately after he has responded. The discussion is further limited to two types of machines—mechanical and electromechanical—which are devised to facilitate the learning of cognitive rather than psychomotor or affective outcomes of learning. Other machines are devised for psychomotor outcomes.

Although many persons are currently devising machines, Skinner's ideas about learning and instruction (1954) are generally accepted as the basis for the recent revival of interest in machines.

First, Skinner accepts the idea that a satisfying consequence or reinforcement immediately following a response facilitates permanent acquisition of the response. Many other psychologists also have high confidence in the efficacy of reinforcement. But Skinner has made the application directly to classroom learning situations. The teacher with even twenty-five students cannot possibly provide the necessary reinforcements to each pupil's responses. Thus, many pupils do not learn efficiently because their correct responses are not reinforced. In fact, many make errors, and it is not until long after the errors have been made that the teacher informs them of their errors. Well-designed machines, readily available to each pupil, can overcome this deficiency.

Second, not only should a response be reinforced immediately, but reinforcements must be made long after the individual has first acquired the response. In school situations, periodic review of material is made by students under teacher guidance. Here also the teacher cannot reinforce the desired responses of each individual in a group situation. But material can be programmed for machine use whereby the proper number and spacing of reinforcements for previously acquired responses can be ascertained and subsequently accomplished. Instead of the ineffective and sometimes haphazard procedures frequently seen in classroom situations, Skinner would make a science of this phase of the instructional program.

Third, there is uncertainty as to the proper number and spacing of reinforcements in early acquisition of behavior. The well-designed machine and program will enable us to ascertain more precisely what this number and spacing should be with each learner and with learners of varying characteristics acquiring varying types of simple responses and more complex behavior patterns. Skinner has found, however, that pigeons, rats, dogs, monkeys, and human children show surprisingly little difference in acquiring behavior patterns.

Fourth, there has been a tendency to use threat of punishment as a means of getting students to learn. This is undesirable because of the possible anxiety produced in the students. The teaching machine not only eliminates this threat but is designed to help the learner move through a carefully graded, progressive program whereby he continuously experiences success along with learning more efficiently. Mechanical and electrical devices can provide the progressive sequences and reinforcements far more efficiently and successfully than a teacher. Skinner reports that a human being cannot arrange the reinforcements and related human variables between experimenter and subject; machines must be used.

Finally, the technical problems and cost of machine instruction are not large in terms of the possible increase in learning efficiency. The necessary techniques are known; the equipment can be readily provided. In relation to the costs of the many labor-saving devices in the homes, the costs of teaching machines in the school are minor. One main obstacle is cultural inertia—a clinging to outmoded traditional procedures and being satisfied with far less than is possible.

Skinner's convincing ideas have led to high interest in teaching machines and to some controlled experimentation in school settings. But more than cultural inertia is delaying their widespread use. As will be shown in the remainder of this section, there are several problems to be met, the most important of which are to program the material properly and to ascertain how well simple responses and larger behavior patterns learned by use of machines transfer to the many nonmachine type of situations in which the acquired behaviors are to be used. However, as stated earlier in the chapter, the teaching machine holds such high promise for improving learning through permitting individualization of instruction that controlled experimentation in school systems is needed.

Functions

The teaching machine may be used to present information to the student: for example, spelling words, the addition "facts" in arithmetic, or the meaning of words. The machine may also be used to examine the student on each bit of information as it is presented; for example, whether he spells a word correctly or gets the correct answer to 4 + 4. Besides providing a check on whether an answer is correct, additional information may be presented if the response is incorrect to facilitate the student's acquiring the correct response. The information to be learned from using the machine is usually so arranged that, when a correct response is given, the student must move to the next item, or frame, of the program. The paper on which the student makes his written response serves as a record of his progress, the usual machine being so constructed that he cannot change an answer.

In general, the student can learn only what has been entered on the program and must acquire it in the same sequence as presented. Thus, anyone who makes a program assumes, or should assume, responsibility for having made certain of at least three things: (1) that he knows what is worthwhile for students to learn, (2) that the sequence of items is arranged to promote efficient learning by the machine user, taking into account such factors as difficulty, relatedness, and meaningfulness of the items in a given program, and (3) that repetition of the same items within a single program or series of related programs is properly managed. All other problems concerned with motivation, the personality of the student, retention, transfer, and individual differences are, or should be, as important considerations for the person who programs material for a teaching machine as for one who writes books or other instructional materials or for teachers generally.

Programing

Teaching machines are based on the idea that the student's responses are both guided and controlled through programing procedures that facilitate the making of the correct response. Some machines allow no new item to be presented until a correct response has been made and also minimize the possibility of incorrect responses. Others permit incorrect responses. It is difficult to decide, in advance of trying out a program, the percent of errors a group of students will make to the items incorporated in the program. However, the decision can be made in advance as to whether to permit one or more incorrect written responses to an item before giving the correct response and moving to the next item.

Skinner (1959) raises questions about the matter of programing and suggests the need for experimentation:

> The manipulation of the student's behavior is another area to be explored. How is the behavior in a given repertoire to be evoked for the first time, and how is it to be brought under the required stimulus control? Presumably experiments will

> be needed to determine (a) an optimal level of difficulty or, conversely, frequency of success, (b) an optimal frequency of recurrence of similar material for purposes of review, (c) an optimal frequency of "exercising" a controlling relation, (d) optimal schedules for seeding review material, (e) the possible use of relatively unrelated material to break up a too-powerful control by a given universe of discourse, (f) the optimal use of thematic and formal supporting material and the rate with which it is "vanished," and so on [Skinner, 1959, pp. 63–64].

Turn now to part of a program in spelling and its preliminary results (Porter, 1959). In 1957-1958 an experiment was conducted in the elementary school with second- and sixth-grade pupils. An experimental and control group were arranged in each grade. The simplest teaching machines were used, with the teaching materials printed on conventional 8½ x 11 paper and fed past the two windows by means of a roller. The student responded to each item of the material and ascertained whether his answer was right or wrong. Correct responses were reinforced immediately.

The teaching materials paralleled as closely as possible the standard lesson materials used by the control groups and prescribed by the school. Actual words taught were exactly the same, and sentence contexts and reading difficulty of the materials were carefully matched. Within the above limitations teaching-machine materials were programed to require the following sequence of response: identification of the spelling words in a meaningful sentence context; matching the correct word to a given definition; matching several words on the basis of letter structure; and writing missing letters in words presented in a sentence context. No spoken instruction was given. The following is a sample of the program material:

1. Underline these words: *thunder, steady, soaked, frightened*

   I hadn't gone halfway when thunder rolled and rain came down in a steady pour. I was soaked. I made a dash for an old horse shed. And there was Wolf. Crouching in the shadow, he looked so like a wolf that for a moment he frightened me.

   frightened *steady* *thunder* *soaked*

2. Circle the word that rhymes with *ready:*

   thunder steady pour soaked

   steady

3. Circle the word that means *firm, regular,* or *not shaking:*

   steady thunder umbrella southern sweeping

   steady

4. Write the missing letters:

   Then rain came down in a s__ea__y pour.

   steady

5. Write the missing letters; they are all the same:

   Ragged clouds were sw____ping the south__rn sky.

   sweeping *southern*

6. Write the missing letters:

   Without thinking of an umbre____a, I set out.

   umbrella

7. Write the missing letters:
   Halfway to the store thu______er rolled.
   thunder
8. Write the missing letters:
   Then rain came down in a s___ea___y pour.
   steady
9. Write the missing letters:
   Brushing, moving quickly, s___ee___ing.
   sweeping

[Porter, 1959, pp. 86–87]

At the time of this writing, final results of the experiment were not available; however, both the second- and sixth-grade experimental groups scored higher on a standardized achievement test in spelling, and Porter assumed that their superiority resulted from use of the machines.

Use of Machines

In school settings, kindergarten through Grade 12, most use of teaching machines has been limited to promotional trials and to research studies. Before widespread research on their effectiveness can be made, much must be accomplished in connection with programing. This is a difficult problem because in the usual school subject-matter fields, there is disagreement as to the best procedure to follow. In a fairly specific area such as spelling, there are marked differences among school systems and among the widely used textbook series as to which words should be included at each grade level. The would-be programmer, if uncertain about the proper number and sequence of words, must rely on textbook writers who have made intensive studies of the use and difficulty of words. Further, textbook writers know that they present only a portion of all the words many children learn in any grade. The machine programmer can accept this idea or he may try to include a much larger number of words. In any event, the possibility for learning directly from a machine cannot be greater than that which is incorporated in the program.

And it must be remembered that the recent wave of teaching machines is largely based on Skinner's conception of learning and upon the present critical need to help children acquire more learning in less time. According to Kendler (1959, p. 184): "There is no psychological principle of which I am aware that would oppose the use of teaching machines. Conversely, there are several principles that would suggest that the teaching machine would be an effective and efficient educational tool. Ultimately we have to develop better theories of behavior, particularly those of transfer and symbolic processes, in order to make the best use of teaching machines. Although it might be unstrategic to consider these theoretical problems immediately, I think it would be more unstrategic to deny their existence."

Notice that Kendler proposes that there are principles of learning which suggest that teaching machines might, be effective *educational tools.* In Chapters 6-12 principles were proposed to implement the learning of various outcomes; not all the same principles were proposed for any outcome of learning. If a teacher were to use a machine, he would find the principles given in Chapters 6 and 8 for facts and skills most closely related to machine use. Examples of other principles from Chapters 6 and 7 which do *not* seem relevant to the use of machines at present are the following:

Encourage and guide searching behavior.
Organize realistic experiences with the concept.
Provide for applications of the concept.
Activate solvable problems in the learning situation.
Assist the learner to state and delimit the problem.
Assist the learner in finding needed information and methods.
Aid the learner in interpreting and analyzing information and methods.
Provide opportunities for stating and testing hypotheses.
Encourage independent discovery and evaluation.
Encourage original expressions in many media.
Foster flexibility rather than dependent conformity.

Pressey is credited with devising the first teaching machine and assuredly is favorable to their widespread use, if they are proven to be helpful and efficient. After pointing to some of the large gaps in present research, he concluded:

> One little-mentioned advantage of a good self-instructional device is that it facilitates research. With enough materials and several sections of a large course available, it may be possible to gather useful data even in one day, process it the next, and so very rapidly get some helpful information on a variety of questions; e.g., desirable difficulty of questions, comparative value of different forms and arrangements of material, and so on. Sometimes the results may be very disillusioning. The writer found that one of his most promising layouts for self-instruction actually brought a bit *less* learning than the same total amount of time spent by the students simply in ordinary study! But a basic fact of life, for the applied scientist, should be kept always in mind: it is not enough that in the experimental situation the proposed new methods work well. They must do so in the average situation where they are to be used and with average people there; and they must there be sufficiently better than the methods and materials these same people have been using, that a changeover is both warranted and feasible. Early and frequent "acid tests" will guide the experimentation in this direction. They may prevent long and expensive ventures later found ineffective or at least impractical. They may also bring out alternative ideas which might otherwise not have been thought of [Pressey, 1959, p. 196].

INSTRUCTIONAL TEAMS

A variety of new approaches to defining the functions and responsibilities of the classroom teacher are being tried. Most of these are based upon one or all of four ideas. First, the traditional arrangement of having one teacher instruct a classroom group of twenty-five to forty pupils is not resulting in the most desirable teaching–learning situations in many cases. Second, since so few persons make classroom teaching a life career, arrangements must be found whereby those who assume this professional responsibility are rewarded accordingly. Third, a better way to attract the most able young people into a life career of teaching is to make certain that a portion of all teachers, perhaps one-fourth to one-half, perform and are rewarded at a professional level. Fourth, some duties currently performed by experienced teachers can be performed equally well (or better) by other persons, for example, secretaries.

Fowlkes (1960) envisioned nine possible strengths for the instructional teams:

1. The instructional team pattern can make possible teaching children in large groups, small sections, and individually, appropriateness to the subject matter being the criterion. Such an arrangement, for example, would make it possible for the entire learning group to be assembled for one type of lesson, such as in poetry or music appreciation; for other presentations both large and small groups might be provided.

2. Team members can be given continuing relationships with the same children over a period of time by dividing the total learning group into equal-sized subdivisions and having certain staff regularly carry on phases of the instructional program.

3. Students can be brought into contact with highly competent teacher-specialists in both large and small groupings. Academically talented students can be assembled for training in various subject-matter fields, while at the same time those requiring remedial help can be given similarly individualized attention.

4. Professional members of the instructional team can be free to refine their specializations and to contribute their competence to all students in the group while serving as consultants to team associates.

5. Noncertified team personnel can perform such necessary chores as record keeping, testing, checking papers; supervision of halls, playground, lunch rooms; obtaining and making available instructional resources; and other kinds of educational housekeeping, thus freeing professional members for professional responsibilities.

6. Various professional talents of members of the team can be pooled to diagnose students' strengths and weaknesses and to develop appropriate educational programs for individual students.

7. The creation of differentiated staff assignments for teachers can make possible advancement from one professional level to another as competence is achieved.

8. Resources such as closed-circuit or nationally released television

lessons can easily be utilized by the large learning group with supplementary follow-up provided by members of the team in smaller subgroups.

9. Greater opportunity can be provided to group students according to such traits as interests, instructional requirements, special talents, for short periods of time without loss of the benefits that heterogeneity may provide.

Illustrative of some of the new approaches are two which were described in the summer of 1959 at a conference sponsored by the Wisconsin School Improvement Program—Teacher Education and Local School Systems.[1]

New Teacher Roles, Norwalk, Connecticut

In general terms, team teaching means a redeployment of teachers in such manner that (1) the strength of each teacher is fully utilized, (2) a regrouping of children from the usual twenty-five to thirty per teacher is done, (3) curriculum and teaching procedures are planned for a larger group of pupils by a team, and (4) continuous and extensive curriculum development is encouraged.

The Norwalk (Connecticut) Plan was the first to tie in a redeployment of finance as well as of teachers. The team consists of the team leader, a cooperating teacher, and a teacher's aide. The aide receives $1700 less than the cooperating teacher. Since this team works with a group of children three times the size of the ordinary class, the team leader and cooperating teacher together receive $1700 more than the regular salary schedule without either increasing or decreasing the cost to the taxpayer; $1167 was added to the leader's salary and $533 to the cooperating teacher's. This in part compensates for the increased work and responsibility necessary for successful team operation.

In the division of responsibilities, the leader and cooperating teacher have opportunities to teach in the areas of their strengths and interests. Since these factors vary among teachers, the assignments are not arranged the same way in every team. In one fifth-grade group the leader handled arithmetic, social studies, and music; the cooperating teacher worked in reading, science, and physical education; they shared responsibility for language. The assignments are different in other teams. Since research has shown that teachers normally spend a fourth to a third of their time doing routine chores, the aide in each team performed these duties, freeing teachers for professional activity. Typically the aides handle report cards, obtain supplies, correct objective tests, type weekly schedules, take care of routine interruptions, make routine phone calls, make entries on cumulative records, run off duplicated materials, collect milk money, bank money, lunch money, and perform other routine activities.

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[1] This program is under the direction of Prof. John Guy Fowlkes. Harry A. Becker, of the Norwalk, Conn., Public Schools, and Bennie Carmichael, George Peabody College for Teachers, described the programs which appear in this chapter. A large number of approaches, including interneship as one form of a teaching team, are under way at the University of Wisconsin and in cooperating public schools at the time of this writing.

Some problems in carrying out the new roles are evident. There has been a certain amount of individual tension, partly because this is like teaching in a goldfish bowl with many visitors, and partly because a great deal of time and effort is required for meetings, preparation, and record keeping. Among the forces that make the roles difficult is the egalitarian tradition among teachers. The team concept implies that the team leader is a teacher-plus and also assumes responsibility-plus. And there is also the tradition of rugged individualism: "I go my way; you go yours." The principal's role must change too. He must be willing to delegate authority and responsibility to the team leader and turn from more simple details of school management to a higher level of work, including more attention to curriculum enrichment, community resources, guidance, and research.

The important gain accruing from the plan is more careful teacher planning. Instead of being responsible for the entire range of subject material, each teacher is usually responsible for only half of it—the half in which she is most competent. Also, interest in research has heightened. Equipment is used more efficiently. The tape recorder is of special significance. By taping lessons, tests, and stories ahead of time, the teacher can be twins, or triplets. This would not be possible if the aides were not available to run the tapes and attend to other details.

Grouping the children for instruction is improved. In the usual self-contained classroom, the teacher does some grouping. But if she has only two very advanced readers she cannot arrange a special group for them. In the team groups, the entire pool of 70 to 80 youngsters is available. From this group six or seven advanced readers may be grouped. Many of the disadvantages usually mentioned in the ancient argument on homogeneous vs. heterogeneous grouping are avoided. With the pool of youngsters, grouping homogeneously is done for some purposes and grouping heterogeneously for others.

And there is no impersonalizing of education. Second-graders like and confide in the adults with whom they work. With the pooling of youngsters there is also a pooling of adult judgment. The instructional team provides a three-dimensional approach to the understanding of pupils and the meeting of their needs.

After the first year, about three-fourths of the parents favored the program; they want their children in it so they can be sure the children have good teachers. Pupils in the plan achieved and liked school better during the experimental year. The pupils say boredom and tension are relieved by moving about and working with three adults instead of one. Staff members in the plan are enthusiastic about it. They do not, of course, discount the appeal of the higher salary, but freedom from routine and the challenge to do the best possible job are the most appealing factors. Almost all of the teachers, within and outside the program, have reacted favorably because they realize this is in no sense a cut-rate program; it is not intended to cheapen education.

Instructional Secretaries

The use of instructional secretaries was tried in two high schools and four elementary schools of Davidson County, Tennessee. In the first year, 1957-1958, the question was raised: Can teachers extend their talents and improve their effectiveness if relieved of time-consuming clerical duties through the use of secretarial help? Six half-time instructional secretaries were employed at a salary of $25 for a 20-hour week. They were married women with excellent training and extensive secretarial experience.

Each secretary was assigned to several rooms, usually six. The principals and teachers outlined the assignments, all secretarial or clerical. The secretaries were not assistant teachers and did not work directly with the children. Among other things, they kept teachers' registers and checked rolls, posted data on school forms, typed letters to parents, cut stencils for tests and prepared other instructional materials, scored and recorded objective tests, operated audio-visual equipment, and wrote letters to make appointments for parent-teacher conferences. During one typical 20-day period, these secretaries completed work on 1028 job assignments which included the handling of some 37,000 pieces of material. One-third of their time was devoted to duplication of teacher-prepared materials.

The 32 teachers participating during the first year were high in their praise of the arrangement, and they reported 297 changes in their teaching practices. Most-affected practices were related to individualization of instruction, home-school relations, increased use of audio-visual aids, and testing and evaluation.

Participating teachers were asked to choose between working with a secretary or without one. Four-fifths of the teachers indicated that a better learning situation could prevail if as many as four pupils were added to any of the four basic class sizes—25, 30, 35, and 40 pupils—if three hours of secretarial help per week were provided. All teachers agreed that they could teach 39 pupils more effectively than 35 with the three hours of secretarial service. This result was significant, particularly since most experimentation of this nature has been looked upon by teachers as increasing their work load. These results, however, do not indicate the desirability of any particular class size, with or without secretarial help.

During the second year of the experiment the service was continued in the same six schools. By the addition of three secretaries, the service was extended to all teachers in two elementary schools; however, in the other two schools, it was withdrawn from six teachers who had received it the first year. During this second year, the service was provided for 61 teachers. Generally, appraisals were more favorable and utilization of the secretaries was more effective in the second year. A definite pattern developed toward greater use of the secretaries for direct improvement of the teaching–learning situation as opposed to the more indirect approach of securing relief from clerical and routine tasks.

The reactions of the six teachers who lost the secretarial help are noteworthy. As compensation for the loss, each teacher's class size was reduced by five to thirteen pupils. These six teachers listed a total of 144 separate pieces of duplicated material, thirteen educational pamphlets ordered by the secretary the previous year, and one set of bulletin board captions still in use during the second year. Of 59 changes in practice listed by them the first year, 9 were no longer employed, 33 were used less frequently, and 17 were still fully in existence. Of the service missed most, four teachers mentioned help in preparing materials of instruction, four listed help in checking and recording, and one missed the help in preparing bulletin board materials. All teachers indicated their out-of-school activities were more restricted. Only one teacher felt her instruction had not been impaired by the withdrawal of the service.

After two years, the results are fourfold: (1) the school people have learned to use secretarial help effectively, (2) the plan to use secretarial help in the manner described is financially feasible, (3) the use of secretarial help leads to improved teaching, and (4) there is an adequate supply of secretarial help available for the schools.

SUMMARY

Technological inventions and knowledge of teaching–learning processes are increasing rapidly. Psychologists, educators, and others must experiment with and appraise TV, teaching machines, electronic equipment, and instructional teams as possible means of improving instruction.

The effective use of closed-circuit and regular channel television, of electronic equipment in foreign-language teaching, and of instructional teams has been demonstrated in many situations. The applicability of electronic equipment to shorthand instruction and of teaching machines to a variety of school situations remains to be validated through controlled experimentation. Unless schools support experimentation with the more recent devices and procedures, an intelligent decision cannot be reached with respect to their most efficient use.

QUESTIONS AND ACTIVITIES

1. Compare the statement of Dunham with the results of the experiment at Miami University. Refer to Dunham's article for a more complete statement.

2. Compare the statement of Mathieu with the description of foreign-language instruction in Russian at Wisconsin. Refer to the Mathieu article, if it is available.
3. (a) Give your opinion of the eventual answer that will be found to the second research problem, p. 412.
   (b) Do the same for the third problem, p. 412.
4. (a) If you were an undergraduate student at Miami University, would you prefer instruction by TV, large lecture classes, or a combination of these? Why?
   (b) In TV classes, conventional classes, or a combination? Why?
   (c) If you were responsible for the instructional program and had plentiful funds, which arrangements would you make available? Why? (Base your remarks on the information presented in the description of the experiment, not on your personal experiences or opinions.)
5. Give your opinions about the importance of the specific objectives of Midwest Airborne Television Instruction.
6. (a) Discuss the possibilities for improving human abilities through in- and out-of-class use of electronic equipment and related instructional procedures in shorthand or foreign-language instruction.
   (b) Which principles given in Chapters 7 and 11 might be implemented more readily with the equipment and related procedures than without them?
7. (a) Keeping in mind your major interest, discuss your present competence in meeting the three requirements for a programmer of teaching machines (see page 430).
   (b) Should the classroom teacher be equally competent as a machine programmer in these matters? Why or why not?
8. Read the entire chapter from which the quotation from Pressey is taken. Then list questions about possible use of teaching machines (self-instructional devices, according to Pressey) at the school level and in the subject matter you are most interested.
9. (a) Give your opinions about each of the reasons given for experimenting with instructional teams.
   (b) Would you prefer to work as a member of a team in the Norwalk or Davidson County plan? Why?
10. (a) Of the several innovations described throughout the chapter, which would you as a teacher prefer to participate in first? Why?
    (b) Should several of the innovations become generally practiced throughout the United States, what changes might be needed in the teacher education program with which you are most familiar?

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Part IV *Evaluation and Measurement*

Appraisal of the abilities and characteristics of learners and evaluation of learning outcomes are two of the most important responsibilities of teachers. Excellent and comprehensive research has been done in appraising abilities, and we are making rapid progress in measurement and evaluation. But we do not have completely adequate procedures and instruments for assessing abilities and affective characteristics at present, nor are the most competent persons in measurement and evaluation completely successful in evaluating how well students learn.

In Chapter 15, the main features of all types of evaluation and measurement are first presented and then a number of the notable published tests are described. Tests which have wide applicability in the schools, Grades 1-12, are given major attention; however, several personality instruments used in research on teacher effectiveness are also discussed. In Chapter 16, informal procedures of evaluation, including teacher-made tests, are considered. Chapter 17 is devoted to the statistical and research terminology frequently encountered in research reports such as those listed in the References at the end of each chapter.

Chapter **15** *Evaluation and Measurement: Standardized Tests*

Evaluation requires the making of judgments about the relative desirability of something in terms of a standard. For example, the teacher evaluates a student's theme, painting, or performance in any area of school work, based upon some standards. Similarly, the student may evaluate his own theme, painting, or science experiment. Most evaluation by school people is concerned with appraising students' abilities and characteristics and with ascertaining student progress toward achieving learning outcomes as set forth in Chapters 6-10.

There is a direct relationship between evaluation and measurement in appraising how well students acquire learning outcomes. The errors in capitalization, spelling, punctuation, and sentence structure may be counted in evaluating a theme, and a rating of the quality of ideas may be expressed in numbers. Likewise, counting the number of exercises correct on an arithmetic test may help to evaluate the student's progress in arithmetic. The relationship between evaluation and measurement is close, with evaluation procedures being the more comprehensive and including all of the measurement devices which facilitate the making of judgments. This relationship is clarified in the discussion of (1) purposes of evaluating and measuring; (2) characteristics of a good evaluative procedure; (3) characteristics of standardized tests; (4) types of standardized and other published tests.

The purposes of evaluating and the requirements of an evaluation procedure considered in this chapter refer not only to published tests, but also to the informal evaluation procedures treated in Chapter 16.

PURPOSES OF EVALUATING AND MEASURING

Whether in a ten-cent store, a supermarket, or a large department store, one sees many instances of the customers and the sales people evaluating and measuring. One objective of education is to assist learners to develop knowledge and skills in evaluating and measuring in their many daily activities. The more specific purposes of teachers and other educational personnel in evaluating and measuring are to:

1. Help the student progress in learning tasks.
2. Ascertain how well the student is learning.
3. Understand the abilities and other characteristics of students.
4. Facilitate self-understanding and self-evaluation by the student.
5. Judge the effectiveness of the instructional and related programs.
6. Assist in making curriculum and administrative judgments.
7. Extend knowledge about human abilities and teaching–learning processes.

1. Help the Student Progress in Learning Tasks

The student needs to know whether he is spelling a word correctly, punctuating properly, or using an appropriate method to solve a problem. He cannot make progress without this information and must either get the information himself or receive help. A most important task of the teacher is to know what is correct or acceptable and to help the student learn what is correct or acceptable.

Incorrect responses or inappropriate methods must also be overcome and causes of a student's lack of progress must be appraised. A variety of informal procedures and published tests, inventories, and check lists are available for this purpose. The most important purpose of evaluation procedures and instruments is to help the student make progress in achieving learning outcomes considered by society, the teacher, and himself to be of value.

2. Ascertain How Well the Student Is Learning

In the process of helping the student make progress in daily, weekly, and longer-term learning tasks, the teacher can also ascertain how well the student is learning; however, in many situations the emphasis is simply to ascertain what the student knows and, on this basis, to award him a grade or rating. In more desirable situations, the attempt is made to ascertain what the student knows at the start of a day, semester, or year, and also what he has learned at points along the way. For example, one form of a standardized test in reading may be given at the beginning of the school year and an equivalent form of the same test toward the end of the school year. To the extent that this standardized test measures the objectives of the instructional program in reading, the test results may be used also to ascertain how well the students have learned during the school year.

Recognizing the importance still attached to grades at the high school and college level, we must make judgments as accurate as possible about what the student knows, how well he performs a variety of tasks, and how well he has learned. If we continue to use grades, the best evaluative and measurement devices should be used to help us make these judgments accurately. The more important purpose, however, is to get reliable information to ascertain how well the student is learning; and if it is found that the student is not making reasonable progress, to do whatever is necessary to improve the situation.

3. Understand Abilities and Other Characteristics of Students

Higher education is elective and not required of students. The college instructor frequently is not interested in the abilities and other characteristics of the students. If they acquire what he considers of value sufficiently well to meet his standards, they are passed in the course; otherwise, they fail. But students are required by law to attend elementary and secondary schools; their parents and they cannot avoid this. The elementary and secondary teacher cannot proceed like the college instructor. To decide whether a child, required to attend school, is making the progress that he might and whether he is learning as well as can reasonably be expected for him, the teacher needs information about the level of each child's cognitive abilities, psychomotor abilities, and other characteristics.

A variety of informal observation procedures can be used for making judgments about the abilities and charactertistics of students. However, it is in this area particularly that published tests are used. Measures of intellectual ability, sometimes called scholastic or academic aptitude tests, educational achievement tests, interest inventories, and the like, are available to facilitate the making of these decisions.

Consider a city in which there are four large high schools. English is required of all students in the ninth grade. In each high school there are a number of beginning, as well as experienced, English teachers. Each teacher is able to observe only the students in the classes taught. How well can each teacher know the intellectual abilities of all of the students during the first week or even during the first month? How well can each pupil's ability to read the required textbook be appraised? Tests of intellectual ability and reading achievement, though far from perfect, may provide useful information for appraising pupil abilities and other characteristics.

One of the important and often neglected components of an over-all evaluation program in the school is that of understanding the abilities and characteristics of students. Teachers at all school levels, including college, are meeting their students for the first day, week, or even months without attempting to ascertain the kind of abilities that are essential to achieving the objectives of instruction. Better results would be possible if the level of abilities and affective characteristics of the student were understood in relation,to demands of the learning tasks.

4. Facilitate Self-Understanding and Self-Evaluation by the Student

Students are in school for a small but critical part of their total life span. One purpose of formal education is to help them understand themselves as individuals and as members of groups. By the time they finish high school, if not earlier, they are expected to set realistic goals and to evaluate their progress toward these goals. Further, they are to make decisions about what is important in life and what they can attain with respect to the kinds of abilities and characteristics they possess.

It is the teacher's responsibility to determine the extent to which students share in gathering, interpreting, and using information that might help the students understand their abilities and other characteristics. Information the teacher might obtain from problem check lists and interest blanks and from intelligence tests, achievement tests, sociometric tests, and the like need to be interpreted to the students if they are to achieve self-understanding. The greater part of this information is not presented to students as a classroom group but in individual conferences or in smaller groups. Further, some information may be withheld from a particular student. But in those areas directly related to progress in learning and ability to learn, students should share in all phases of information gathering and interpreting so that they identify their strengths and weaknesses and use the information for self-understanding and improvement.

5. Judge the Effectiveness of the Instructional and Related Programs

Assume that the teacher has set the objective of all students' learning to recognize participial phrases. The first part of the class period is spent in teaching; toward the end, a short test is given. This test not only tells the extent to which the students have learned to recognize participial phrases, but also suggests whether the teaching method was effective and whether the teacher's objective was realistic. If most students had half of the test items wrong, it is quite certain that the objective was not realistic, or the method of teaching was ineffective, or characteristics of the students led to the poor performance. Careful analysis of the situation may help in deciding the causes of the poor learning situation.

Consider a second example related to guidance. Tenth-grade students are randomly put into two groups, one to receive six counseling interviews during the year, the other group to receive none. One purpose of the counseling interviews is to help the students understand their own abilities. At the end of the year a skilled person evaluates the effects of the counseling. If no difference is found in self-understanding between those counseled and those not counseled, the conclusion may be safely drawn that the counseling procedures did not achieve the desired objective.

6. *Assist in Making Curriculum and Administrative Judgments*

Which children shall be retained in the grade, which shall be promoted, and which shall be accelerated? If classes are arranged for educable mentally retarded children and for those of superior learning ability, which students shall be selected for these classes? And among the high school seniors, which shall be recommended for matriculating in a college or university and which shall not? What kinds of reading materials are most appropriate for students in the seventh (or any other) grade? These are types of curriculum and administrative decisions that are continuously being made. It is only through a comprehensive program of evaluation and measurement that these decisions can be made intelligently.

7. *Extend Knowledge About Human Abilities and Teaching–Learning Processes*

Measurement in the physical sciences is highly precise and accurate. In the biological sciences measurement is less exact, apparently because the things measured in the biological sciences are more complex than are those in the physical sciences. In the social sciences, where study is focused upon human beings, the most complex of all biological organisms, measurements are less exact than in either the physical or biological sciences. In most educational settings as described previously in Chapters 1 and 14, there are many human beings who continuously interact. The problem of making value judgments about human abilities and teaching–learning processes is much more complex than making similar judgments about the properties and interactions of various chemicals or of lower forms of animals.

As has been suggested many times in the previous chapters, our knowledge about human abilities, including the realm of teaching–learning processes, is far from perfect. The great advances in recent years in identifying abilities occurred in military settings. We are just beginning to carry out the kind of research with children of school age that is so vital for the improvement of teaching–learning processes. We still proceed on a trial-and-confirmation basis in many areas of school learning; that is, the students are enrolled in the school, they engage in various learning activities, and, on the basis of our daily judgments of their performances, we estimate how they should perform.

CHARACTERISTICS OF A GOOD EVALUATION PROCEDURE

Any evaluation procedure, whether it be a standardized educational achievement test or an informal method of observing and evaluating the students' performance, should be valid, reliable, and useable. These terms have special significance for published tests and, to a lesser extent, for the daily and informal evaluation procedures used by teachers.

Validity

Tests and other evaluation procedures are useful in making various judgments or decisions. A person using a test wants to know how valid a test is for achieving certain purposes. Concerning these purposes and types of validity related thereto, we turn to *Technical Recommendations for Achievement Tests* (1955).

> Four types of validity have been distinguished, namely, content validity, concurrent validity, predictive validity, and construct validity.
>
> *Content validity* is concerned with the sampling of a specified universe of content.
>
> *Concurrent validity* is concerned with the relation of test scores to an accepted contemporary criterion of performance on the variable which the test is intended to measure.
>
> *Predictive validity* is concerned with the relation of test scores to measures on a criterion based on performance at some later time.
>
> *Construct validity.* More indirect validating procedures, which we refer to under the name *construct validation,* are invoked when the preceding three methods are insufficient to indicate the degree to which the test measures what it is intended to measure.
>
> We can illustrate these concepts by examining various ways in which a test of interpretive reading in science might be employed. A science teacher may wish to determine the proficiency of his students with respect to this teaching objective. Interpreting the test for this purpose requires information on *content validity:* Does the test present the types of situations to which the teacher is trying to teach students to respond?
>
> The teacher would examine the evidence furnished by the producer of the test specifying the universe from which reading selections were sampled, and he would examine the types of questions included in the test. The teacher might be interested in knowing either whether the paragraphs and questions asked are representative of the reading materials his students have been studying, or whether they are representative of the science reading materials encountered in adult activities.
>
> The teacher may also be interested in using the objective test to replace the much more time consuming and difficult method he now employs to evaluate the achievements of the students in a particular course. A decision as to whether this test is a satisfactory substitute requires evidence of *concurrent validity.* If the teacher, for instance, is satisfied that the students' ability to make critical interpretations and applications in free response to a paragraph is a good measure of the objective, he may inquire whether ability to select the best of several interpretations offered in a multiple choice test measures the same ability.
>
> The guidance counselor may have occasion to consult the same test scores for the purpose of advising students concerning election of a science course in college. Such use of test scores involves prediction of later performance and, hence, depends on *predictive validity.* The counselor would need to know how accurately scores on this test predict achievement in college science courses. He would consult the evidence concerning the correlation of the test scores with measures of achievement in college science courses accepted as criteria for the purpose.
>
> It may be noted that concurrent validity refers to the relation between test scores and criterion scores which can be obtained at the same time, while predictive validity refers to the relation between test scores and criterion scores which cannot

be secured until some time later. The former answers the question, "With what degree of accuracy can the test scores replace the scores on an existing criterion?" The latter answers the question, "With what degree of accuracy can the test scores estimate the scores on the criterion that the test subjects would achieve some time later?"

For any of the three purposes described above, the specified types of evidence of validity may not be available, either because the universe of content cannot adequately be specified or because an acceptable criterion is not available. In such cases the test user must judge the validity of the test for his purpose on the basis of such evidence as the test producer presents. The use of logical inferences from experimental evidence or other information relevant to any aspect of test validity has been termed *construct validity.*

Construct validity is highly important in achievement testing. In the first place, universes of content, while relatively easy to specify in the traditional school subjects, nevertheless are very difficult to specify in many important areas such as study skills, attitudes, interests, understandings, and appreciations. Second, altho in some cases criteria for concurrent validity can be obtained, as in the example above, this is not generally the case. In fact, for the purposes of most educational achievement tests, no suitable concurrent criterion of performance has usually been available to determine validity in terms of a correlation coefficient or other quantitative objective measure. Such criterion data as teachers' ratings, course grades, or teacher-constructed examination grades are generally inadequate for this purpose and frequently inferior to the tests for which they are to be used. The same considerations apply to predictive validity in many situations.

The most typical example of construct validity applied to an achievement test in a traditional subject in which the universe of content is accepted, but a suitable (concurrent) criterion is not available, is the procedure by means of which the discrimination of the test scores is measured between successive grades in a sequence of courses. The information obtained by this means permits the logical inference that those grade groups in the sequence which have received more instruction attain a higher level of achievement. The same or experimentally similar approaches may be followed to adduce information bearing on construct validity for any use of a test. Content, concurrent, and predictive validity may be thought of as specialized aspects of construct validity.

In the earlier days of educational measurements this second consideration was commonly referred to as the "statistical validity" of the test. That label was neither descriptive nor meaningful. The terms *concurrent* and *construct* validity are recommended as more understandable concepts. . . .

It may be advisable to point out that for instructional uses of achievement tests (diagnosis and analysis of achievement, planning of remedial work, and determination of supervisory needs of the teacher) content validity is important. For administrative uses of test scores (classification of pupils, promotion, and school records of achievement) it is only the concurrent and construct validity that are important. It is the measure of the accuracy of the inferences which determine administrative decisions. In such cases content validity is important primarily as it lends logical support to concurrent or construct validity.[1]

The above explanations refer to achievement tests. Present achievement tests meet the various criteria of validity to a higher degree than do many other types of published tests. For this reason it is important that the test user makes certain that any test he uses is valid for his purposes. Another publication, *Technical Recommendations for Psychological Tests and Diagnostic Techniques* (1954), describes similar bases of validity which should be considered in all published tests. Both publications point out that the test manual which accompanies any published test should clearly indicate the types of validity described above, as well as other characteristics of the test, including reliability.

---

[1] *Technical Recommendations for Achievement Tests,* American Educational Research Association and National Council on Measurements Used in Education, 1955, pp. 16–19.

Reliability

Reliability refers to the degree to which the test is consistent or agrees with itself. There are several types of reliability and related methods for ascertaining the degree of reliability.

One procedure is to ascertain how consistently the test measures at two points in time. For example, some students are administered the same test on two occasions; the two sets of scores are correlated, and the result obtained is the *coefficient of stability*. If a spelling test of fifty words were given on two consecutive days to the same students, with no learning intervening, and each student obtained the same score both times, the coefficient of stability would be perfect, 1.00. If, however, individuals' scores changed, the coefficient would be lower; and the greater the inconsistency between tests, the higher the unreliability of the test.

Two forms of the same test may be constructed and administered in close succession to the same students. A correlation, called a *coefficient of equivalence,* is computed and is an indication of the reliability or accuracy with which the two forms measure. Test makers often produce several forms of educational achievement and other tests. The equivalent forms are needed in part to prevent practice or learning effects from influencing scores when the same test is given repeatedly to some students but not to others. Equivalent forms of an achievement test at the beginning and end of a unit, semester, or year are useful to ascertain what a group of students has achieved. Few, if any, tests are sufficiently reliable to be considered completely accurate measures of each individual's gain during the year.

When only one test is available, the split-half method is used to ascertain reliability. The test is administered in the usual fashion, but then is scored in two parts. Each half of the test is considered an equivalent and independent form of the same test. Various means are used to make certain that the items in each half of the test are independent and that the students have sufficient time for answering all items in the entire test when it is administered. A correlation between the two sets of scores is then obtained as a measure of equivalence. This method can be applicable to teacher-made tests and to many experiments in which only a single test is utilized.

Other means of determining internal consistency can be applied to single tests in which each correct response is scored one and each incorrect response zero. Reference to a procedure most applicable to teacher-made tests is given in Chapter 16.

Why are accurate, consistent measures needed? Why is the test maker so concerned about reliability? The test maker wants to produce accurate measuring instruments for the same reasons as do manufacturers of the tools used in linear measurement, liquid measurement, and the like. If a measuring instrument has low reliability, it also has low concurrent and predictive validity. For example, an unreliable achievement test in reading, administered early in the first grade, is of no value in ascertaining children's present reading achievements or in predicting their subsequent achievements, much as an unreliable spring scale is not useful in ascertaining the present or subsequent weight of children.

What conditions may result in low reliability of tests? Five of the more important follow. First, a test may be unreliable because of poorly constructed items that do not discriminate between students who possess the knowledge, skill, or other attributes being tested and those who do not. More attention will be given in Chapter 16 to constructing tests whereby this can be avoided.

Well-constructed items which are so easy that most students get all of them correct or so difficult that most students cannot answer them correctly also yield low reliability coefficients. The too easy and too difficult items do not spread the scores of the students. In this connection, a test may be reliable for nine-year-olds but quite unreliable for seven- and eleven-year-olds; it may be reliable for nine-year-olds in the average achievement range but unreliable for those of exceptionally high or low achievements. Also, a test that has high reliability after a year of instruction may show low reliability if administered at the beginning of the year.

Reliability also depends on length of the test. A single spelling word or science concept is a poor and inadequate sample of the student's performance. If ten items are given, one student may guess three or four items correctly; another may guess three or four incorrectly. Thus, chance would be an important determiner of the scores obtained. In a test of fifty items, there is a better possibility that the two students would guess an equal number of items correctly and incorrectly. A test can, of course, be made so long that students become tired or bored and respond unreliably.

Inadequate scoring methods may also produce low reliability—one of the principal weaknesses of essay tests, as will be discussed more fully in Chapter 16. Besides essay tests, other tests in which unequal weights are given to items also are subject to low reliability, particularly if the students are unaware of the unequal weights. For example, if four items of a forty-four-item test are scored ten points each and the other forty are scored one point each, missing one or two of the former greatly lowers the score. In short-answer essay tests or other tests where items are given unequal weight, it is good practice to inform students of the scores assigned to each item so that they may use the available time accordingly.

Finally, inadequate time to complete a test lowers reliability in any test where time is not a criterion of performance. This is a difficult problem to overcome, for the rate at which students respond to a test varies markedly. If time is called when the first half of the group is finished, one cannot be certain how the other half would have scored had time been allotted for them to finish.

Useability

A number of practical considerations must be taken into account in addition to the more theoretical considerations of validity and reliability. These more practical considerations are designated by the term *useability,* which refers to the extent to which the test can be used by teachers and others. Six practical considerations are these: the amount of time required to administer the test; the amount of preparation or education required to administer, score, and interpret the test; the amount of time required to score the test; the ease of interpreting the test results after the scores are obtained; the cost; and the mechanical make-up of the test. Since these considerations are of practical significance, published tests usually provide such information in the test manual. The best source book for finding this information on a large number of tests is Buros (1959). This book includes not only descriptive information concerning many published tests, but also critical reviews of the various tests and a bibliography of articles and books which have appeared about each test. Most of the evaluative comments which appear in the subsequent section of this chapter are based on the author's study of the test, the manual, and the critical reviews in Buros.

CHARACTERISTICS OF STANDARDIZED TESTS

A standardized (standard) test has four distinguishing characteristics:

1. The items have been carefully selected, and if the technical recommendations concerning requirements of an evaluation instrument (as outlined previously) are followed, systematic study has been made of the test to determine its reliability, validity, and useability. The type of validity and reliability is reported in the test manual. The items in the test constitute a systematic sample of the universe of performances or abilities which the test purports to measure.

2. A second characteristic of a standardized test is that the method for administration of the test is standardized. These instructions are in the manual for guidance of the test administrator and, as necessary, on the test copy for the person being tested. The exact words to use in administering

the test, the amount of time to be allowed for the students to complete the test, and the type and amount of help and encouragement to be given are clearly specified. For example, the *Teacher's Manual, Iowa Tests of Basic Skills* (1956) gives a brief overview of the test, and then instructions for preparing to administer the test, including advance arrangements about seating, pencils, and scratch paper; a time schedule for administering the entire battery of tests; distributing and collecting test materials; timing the tests; responsibility for proper marking of the tests; and preparing the pupils for taking the tests. (These are also important in preparing to administer a test that the teacher has constructed.)

Specific instructions for opening the first test period are next given. After these appear the instructions for pupils' putting their names on the answer sheets and for marking the answer sheets properly. The directions for administering the Vocabulary Test start as follows, with the first paragraph for the teacher's information and the next paragraph to be read to the pupils:

> This test requires 17 minutes of actual working time. It should be administered immediately after giving instructions to pupils for marking the answer sheets, as directed in the preceding section.
>
> (1) Begin by saying:
>
> "We are now ready to begin work on the first test. This is a vocabulary test like the practice test we just studied. Find the section labeled Test V, Vocabulary, on your answer sheet near the top on the front side. (Pause.) Now place your answer sheet beside page 3 of your test booklet. (Pause.) We will read the directions at the top of page 3 to remind you of what you are to do. Read them silently while I read them aloud. They say:
>
> "In each exercise, you are to decide which one of the four words has most nearly the same meaning as the word in heavy black type above them. Then, on the answer sheet, find the row of circles numbered the same as the exercise you are working on. You are to fill in the circle on the answer sheet that has the same number as the answer you picked. The sample exercise in the box at the right has already been marked correctly on the answer sheet [*Teacher's Manual, Iowa Tests of Basic Skills,* 1956, p. 9].

This is followed with instructions for the teacher or other test administrator to make certain that the procedures are clearly understood by the pupils and to get them started with the first test item.

3. A third feature of a standardized test, but not of all published tests, is that the scoring is standardized. Whether the student enters his response on the test copy or answer sheet, a scoring key is provided. For tests in which the items cannot be scored as right or wrong the instructions needed for making judgments are given. The *Handbook for Essay Tests, Level 1, College Sequential Tests of Educational Progress* (1957) suggests that students' essays be rated from 1 to 7, seven being the highest rating. In the original scoring on which the subsequent norms were based, the readers

scored on the basis of three factors: Quality of thought—50 percent, Style—30 percent, and Conventions—20 percent.

"Quality of thought" was defined as "the selection and the adequacy of ideas and supplementary details, and the manner of their organization (i.e., the way in which their connections are derived from the arrangement of parts)."

"Style" was defined as "clearness, effectiveness, and appropriateness, including matters of structure and diction, emphasis, the *means* of transition between ideas, and the finer points of simplicity, economy, variety, and exactness of expression."

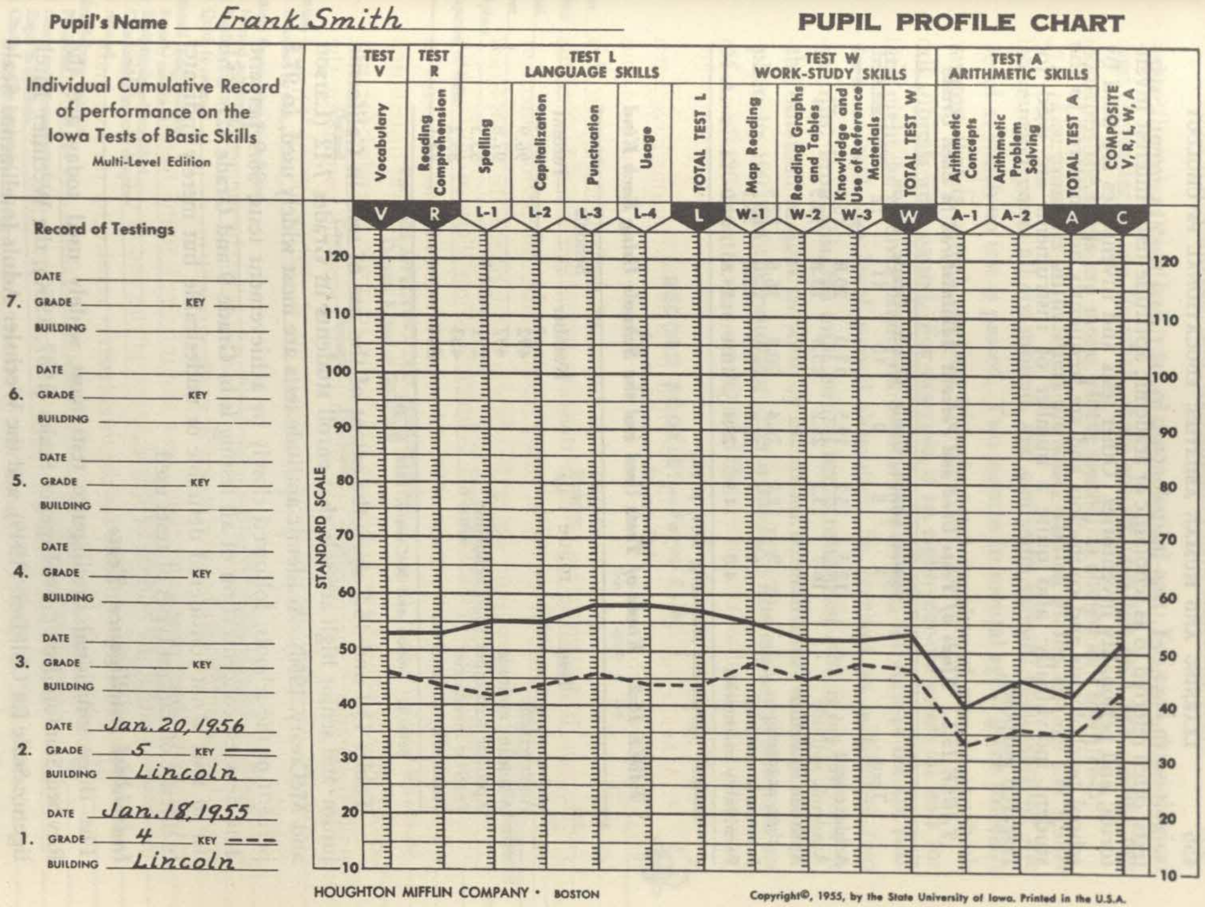
"Conventions" was defined as "the properties of mechanical form, including grammar and usage, capitalization, punctuation, and the mechanical aspects of the structure of sentences." A number of essays are then presented in the handbook with ratings and comments to guide the rater in making his judgments.

4. A final characteristic of standardized tests is that norms have been established whereby scores made on the test can be interpreted in terms of grade equivalent, percentile, or other forms of derived scores. In this connection, it should be made clear that a norm is not a standard to be reached, but a range of values or scores, constituting the performances or scores made by the group on which the test was standardized. In the *Manual for Administrators, Supervisors, and Counselors, Iowa Tests of Basic Skills* (1956, p. 80), we find that a total of 74,174 pupils from 213 school systems in 46 states was included in the normative sample. This total was distributed about equally among the grades in which the tests are intended for use, namely, Grades 3 through 8. The manual also gives the percent of the normative sample from the different geographical regions of the United States.

Based upon this sample, tables were developed whereby the actual scores made by the pupils can be interpreted in grade equivalents or in percentile ranks under three time conditions: tests administered at the beginning of the school year, at the middle of the year, and at the end of the year. These grade equivalents are available for the total battery results; for the five main tests—vocabulary, reading, language skills, work-study skills, and arithmetic; and for four subtests in language, three in work-study skills, and two in arithmetic skills. Figure 15.1 shows the grade equivalents in profile form of Frank Smith as a fourth-grader (broken line) and as a fifth-grader (solid line) on achievements as measured by this test.

COMMONLY USED STANDARDIZED AND OTHER PUBLISHED TESTS

The principal published instruments administered by teachers in the school to groups of students are educational achievement tests; intellectual ability



tests, often referred to as scholastic or academic aptitude tests; interest inventories; and personality inventories. Other tests and inventories are used by school psychologists and counselors and are frequently administered to the student individually; also quite a number of instruments are used for research purposes.

TABLE 15.1. ***Kinds of Tests Used and Percent Administered in Each Grade***

Tests	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12	Unclassified
Achievement	12.3	13.2	19.5	17.0	20.8	16.9	.2
Academic aptitude	16.7	13.2	25.2	15.4	13.8	15.3	.4
Aptitude tests other than academic	.9	12.9	26.4	20.8	16.6	22.5	
Interest inventories	.1	.7	36.0	15.8	12.2	35.1	
Personality inventories	4.0	4.9	29.4	18.4	14.4	29.0	

SOURCE: *Larson and McCreary, 1956, p. 391.*

TABLE 15.2. ***Kinds of Tests Used and the Schools Using Each Kind***

Tests	Schools Number	Schools Percent
Achievement	492	96.9
Academic aptitude	497	97.8
Aptitude tests other than academic	271	53.3
Interest inventories	433	85.2
Personality inventories	244	44.1

SOURCE: *Larson and McCreary, 1956, p. 391.*

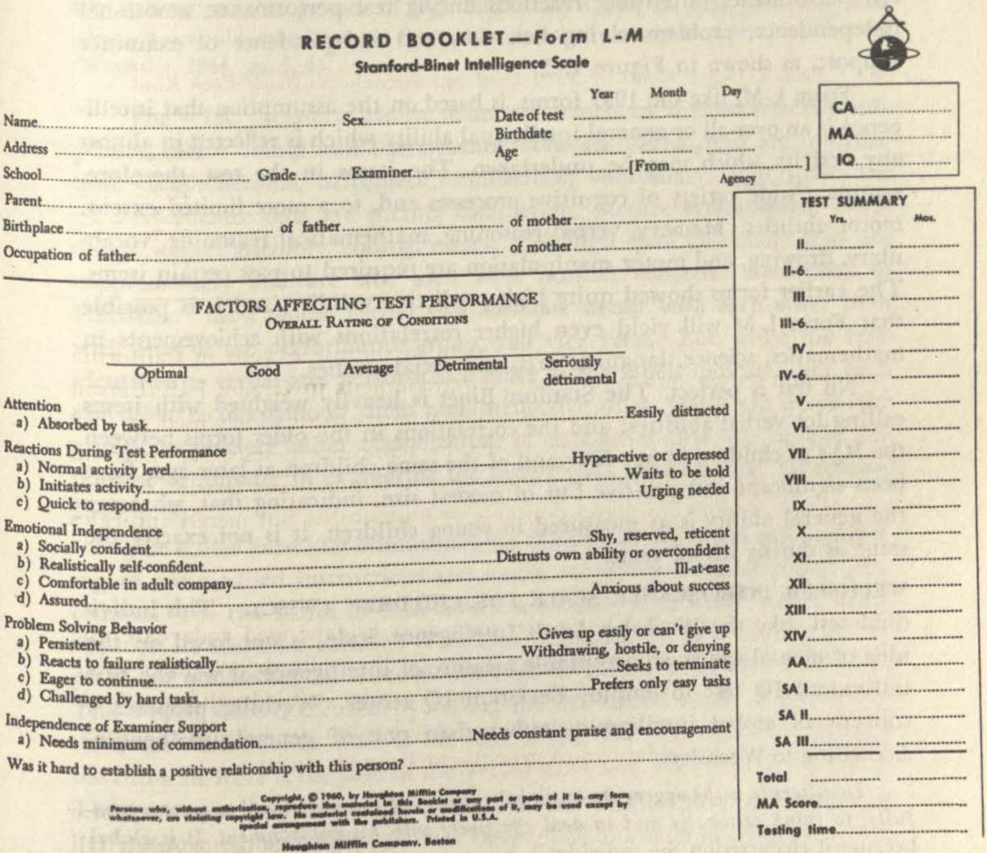
Tables 15.1 and 15.2 show the extent of the use of tests in California junior and senior high schools that enroll students in Grades 7-12 (Larson and McCreary, 1956). Academic aptitude tests are most widely used, in 97.8 percent of the schools, followed closely by achievement tests, 96.9 percent. The heaviest concentration of all testing is in Grade 9 and Grade 12. This use of tests is not considered desirable or undesirable but merely indicates incidence of various types of tests used.

Individual Intelligence Tests

The three individual intelligence tests most widely used today are the Revised Stanford-Binet Intelligence Scales (1937, 1960), the Wechsler Intelligence Scale for Children (1949), and the Wechsler Adult Intelligence Scale (1955). These tests are administered to the individual by a skilled examiner. The three tests are measures of general intellectual ability.

REVISED STANFORD-BINET INTELLIGENCE SCALE. The new 1960 Form L-M tests levels of mental development from age two to Superior Adult III, much as did the 1937 Forms L and M. However, Form L-M consists of the best items from the two previous forms. From ages two to five, there are six tests (items) at each half year of chronological age. For each chronological age thereafter to age fourteen, there are six tests for each year. After age fourteen the levels are more widely spaced, as shown in Figure 15.2.

The examiner administers the scale, starting at the age level at which the subject passes all six subtests, and continues upward until reaching the level at which no test is passed. Two months in mental age is given for each subtest that is passed, starting with the total number of months at which all subtests were passed. For example, if an eight-year-old passes all tests for age eight, he receives ninety-six months mental age; for each of the six subtests at each age level passed thereafter, he receives an additional two months. From this, his total mental age is computed (this is his raw score); the obtained M.A. is divided by his actual chronological age (C.A.) multiplied by 100, and the resulting score is his IQ. The eight-year-old with an M.A. of 120 months has an IQ of 125.



RECORD BOOKLET—*Form L-M*

Stanford-Binet Intelligence Scale

	Year	Month	Day
Date of test			
Birthdate			
Age			

CA..........
MA..........
IQ..........

Name.......... Sex..........
Address ....
School.......... Grade.......... Examiner..........[From..........] Agency
Parent..........
Birthplace.......... of father.......... of mother..........
Occupation of father.......... of mother..........

FACTORS AFFECTING TEST PERFORMANCE

Overall Rating of Conditions

Optimal Good Average Detrimental Seriously detrimental

Attention
a) Absorbed by task..........Easily distracted

Reactions During Test Performance
a) Normal activity level..........Hyperactive or depressed
b) Initiates activity..........Waits to be told
c) Quick to respond..........Urging needed

Emotional Independence
a) Socially confident..........Shy, reserved, reticent
b) Realistically self-confident..........Distrusts own ability or overconfident
c) Comfortable in adult company..........Ill-at-ease
d) Assured..........Anxious about success

Problem Solving Behavior
a) Persistent..........Gives up easily or can't give up
b) Reacts to failure realistically..........Withdrawing, hostile, or denying
c) Eager to continue..........Seeks to terminate
d) Challenged by hard tasks..........Prefers only easy tasks

Independence of Examiner Support
a) Needs minimum of commendation..........Needs constant praise and encouragement

Was it hard to establish a positive relationship with this person? ....

TEST SUMMARY

	Yrs.	Mos.
II		
II-6		
III		
III-6		
IV		
IV-6		
V		
VI		
VII		
VIII		
IX		
X		
XI		
XII		
XIII		
XIV		
AA		
SA I		
SA II		
SA III		
Total		

MA Score..........
Testing time..........

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Houghton Mifflin Company, Boston

FIGURE 15.2.

The older forms were based upon the assumption that mental growth started slowing down at age thirteen and reached its maximum at age sixteen. The new Form L-M is not based upon this assumption and, although the idea of mental age is not abandoned, the IQ may now be converted into a deviation IQ. (For a more complete consideration of how scores are changed into deviation scores, see Chapter 17.) The principal advantage of the deviation IQ over the older ratio IQ's, $\frac{\text{M.A.}}{\text{C.A.}} \times 100$, is that with the earlier forms, changes in ratio IQ occurred in the same children with age, simply because the test was inadequately scored. In older forms, a child at age sixteen years six months received an IQ of 138 by having passed certain tests; in the new form his deviation IQ is 132 for passing the same tests; and this is what it should be. Besides getting a reliable estimate of IQ the examiner observes and rates characteristics of the child affecting test performance: attention, reactions during test performance, emotional independence, problem-solving behavior, and independence of examiner support, as shown in Figure 15.2.

Form L-M, like the 1937 forms, is based on the assumption that intelligence is an over-all or general intellectual ability which is reflected in almost any activity which may be undertaken. The items in the test, therefore, sample a wide variety of cognitive processes and, to a more limited extent, motor abilities. Memory, verbal reasoning, mathematical reasoning, vocabulary, drawing, and motor manipulation are required to pass certain items. The earlier forms showed quite high predictive validity, and it is possible that Form L-M will yield even higher correlations with achievements in mathematics, science, language arts, and social studies.

No test is perfect. The Stanford-Binet is heavily weighted with items calling for verbal abilities; and the correlations in the older forms between the IQ's of children at age four and of the same children at later ages have been significant and positive but of modest size, indicating that, whatever the general ability is as measured in young children, it is not exactly the same as during school years.

WECHSLER INTELLIGENCE SCALE FOR CHILDREN (WISC). This individual test, like the Wechsler Adult Intelligence Scale, is not based on the idea of mental age as an acceptable measure of intelligence; it was the first individual IQ test to employ deviation IQ scores. Wechsler proposes a concept of global intelligence rather than one of general intelligence. According to Wechsler:

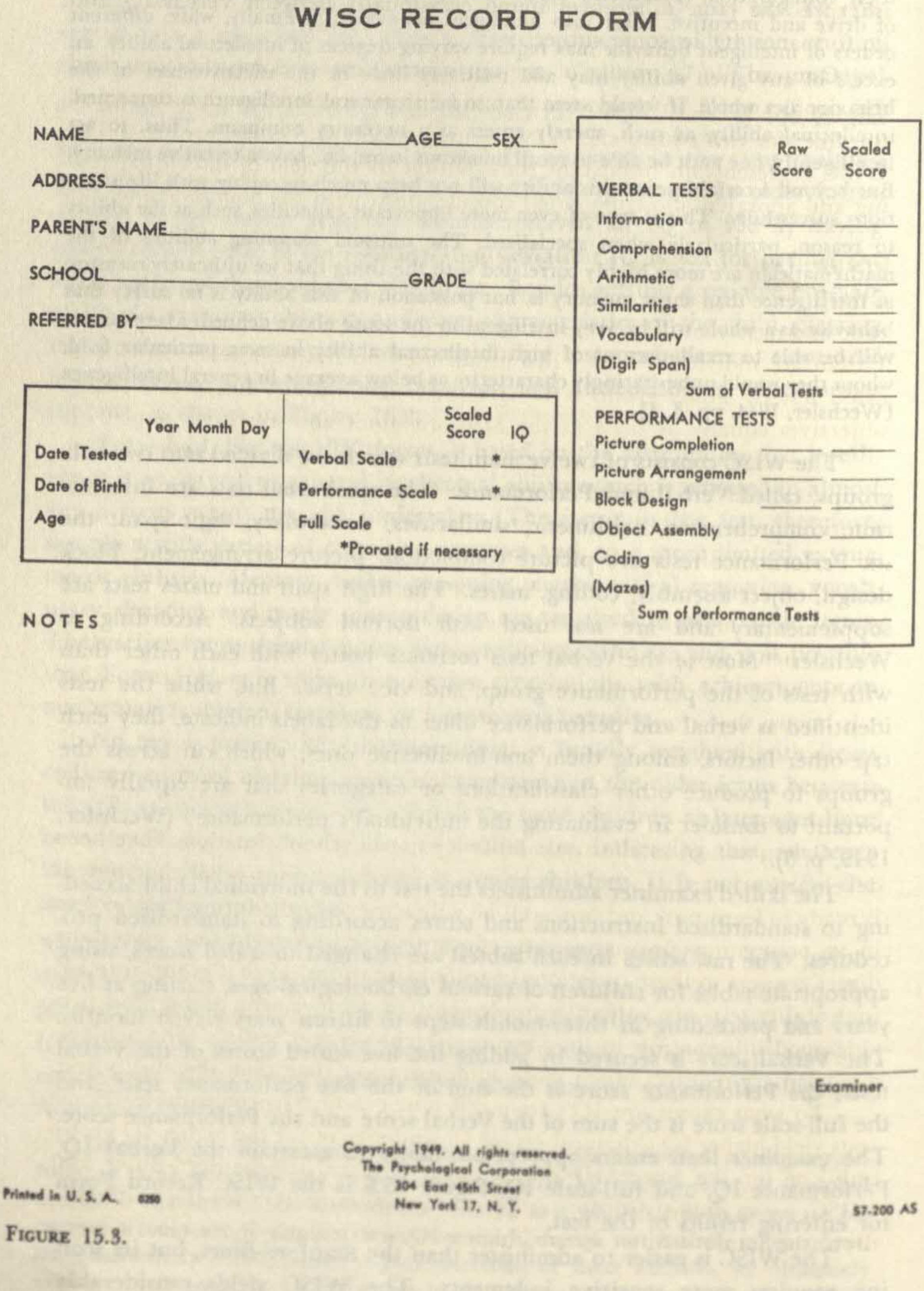
> *Intelligence is the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with his environment.* It is global because it characterizes the individual's behavior as a whole; it is an aggregate because it is composed of elements or abilities which, though not entirely independent, are qualitatively differentiable. By measurement of these abilities, we ultimately evaluate intelligence. But intelligence is not identical with the mere sum of these

abilities, however inclusive. There are three important reasons for this: (1) The ultimate products of intelligent behavior are not only a function of the number of abilities or their quality but also of the way in which they are combined, that is, upon their configuration. (2) Factors other than intellectual ability, for example, those of drive and incentive, enter into intelligent behavior. (3) Finally, while different orders of intelligent behavior may require varying degrees of intellectual ability, an excess of any given ability may add relatively little to the effectivenesses of the behavior as a whole. It would seem that, so far as general intelligence is concerned, intellectual ability, as such, merely enters as a necessary minimum. Thus, to act intelligently, one must be able to recall numerous items, i.e., have a retentive memory. But beyond a certain point this ability will not help much in coping with life situations successfully. This is true of even more important capacities, such as the ability to reason, particularly when specialized. The unusual reasoning abilities of the mathematician are more highly correlated with the thing that we ultimately measure as intelligence than sheer memory is, but possession of this ability is no surety that behavior as a whole will be very intelligent in the sense above defined. Every reader will be able to recall persons of high intellectual ability in some particular field, whom they would unhesitatingly characterize as below average in general intelligence [Wechsler, 1944, pp. 3, 4].

The WISC consists of twelve main tests which are divided into two subgroups, called Verbal and Performance. The six Verbal tests are information, comprehension, arithmetic, similarities, vocabulary, digit span; the six Performance tests are picture completion, picture arrangement, block design, object assembly, coding, mazes. The digit span and mazes tests are supplementary and are not used with normal subjects. According to Wechsler: "Most of the verbal tests correlate better with each other than with tests of the performance group, and vice versa. But, while the tests identified as verbal and performance differ as the labels indicate, they each tap other factors, among them non-intellective ones, which cut across the groups to produce other classifications or categories that are equally important to consider in evaluating the individual's performance" (Wechsler, 1949, p. 5).

The skilled examiner administers the test to the individual child according to standardized instructions and scores according to standardized procedures. The raw scores in each subtest are changed to scaled scores, using appropriate tables for children of various chronological ages, starting at five years and proceeding in three-month steps to fifteen years eleven months. The Verbal score is secured by adding the five scaled scores of the verbal tests; the Performance score is the sum of the five performance tests, and the full-scale score is the sum of the Verbal score and the Performance score. The examiner then enters appropriate tables to ascertain the Verbal IQ, Performance IQ, and full-scale IQ. Figure 15.3 is the WISC Record Form for entering results of the test.

The WISC is easier to administer than the Stanford-Binet, but its scoring requires more sensitive judgments. The WISC yields. considerably



WISC RECORD FORM

NAME ____________ AGE ______ SEX ______

ADDRESS ____________

PARENT'S NAME ____________

SCHOOL ____________ GRADE ______

REFERRED BY ____________

	Year	Month	Day
Date Tested			
Date of Birth			
Age			

	Scaled Score	IQ
Verbal Scale	*	
Performance Scale	*	
Full Scale		

*Prorated if necessary

	Raw Score	Scaled Score
VERBAL TESTS		
Information		
Comprehension		
Arithmetic		
Similarities		
Vocabulary		
(Digit Span)		
Sum of Verbal Tests		
PERFORMANCE TESTS		
Picture Completion		
Picture Arrangement		
Block Design		
Object Assembly		
Coding		
(Mazes)		
Sum of Performance Tests		

NOTES

______________ Examiner

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57-200 AS

FIGURE 15.3.

lower IQ's, especially at 115 and above, than did the older forms of the Stanford-Binet. The Verbal IQ correlates higher with school achievements than does the Performance IQ; and considerable research is yet needed to interpret the large differences found occasionally between Verbal IQ and Performance IQ in some subjects.

One can plot a profile of the ten subtest scores. Some clinicians find the profile useful in diagnosis of brain injury, personality disorders, and the like; for this reason the WISC is used widely in clinical settings. The WISC represents an important contribution in the field of individual testing and appraisal, meriting equal consideration with the Stanford-Binet.

Group Tests of General Intellectual Ability

Group tests of general intellectual ability, sometimes called scholastic aptitude and mental ability, are used far more extensively in schools after Grade 1 than are individual tests. The group tests do not require specially educated testers. Many group tests have predictive validity for certain school objectives equally as high as the Stanford-Binet and Wechsler tests.

The administration of any group test requires that each student taking it understands the directions, wants to do his best, and is physically and emotionally in good condition to do his best. In small classroom groups, the tester, usually the teacher, can observe each student fairly well to see that these conditions are met. When group tests are administered to large groups, it is more difficult to make certain that the three conditions are met. When a purpose of testing is to secure a more thorough understanding of the individual, the individual IQ test is far superior to group tests. Also, it is known that group verbal tests are not so useful as individual tests with younger children who cannot read, children with any sort of severe handicap, and any person who had not had the opportunity to learn to use the English language.

Group tests of intellectual ability for use in school situations have been developed primarily to help make two types of decisions—what the student is ready to learn now and how well he will achieve in the future in school or in an occupation. In many cases, educational achievement tests give more direct answers to these questions in school situations, so that group intellectual ability tests are valuable supplements to achievement testing and provide good information in the absence of achievement testing. The achievement battery requires much more administration time than the ability test.

To what extent are IQ's from different group tests comparable? Some tests yield higher IQ's than others for all students, or for the higher IQ group only, or for the lower IQ group only. The earlier Stanford-Binet and WISC, for example, did not secure exactly the same IQ's for the same children; the Stanford-Binet secured higher IQ, particularly above 115. Reports of differences among several commonly used group tests for small samples of subjects are available and may be consulted by school administrators. However, a better way for a larger school system to determine the best testing program is to set up carefully designed studies to ascertain testing needs for its child population. Further, the increasing (and desirable) tendency of test makers and publishers is to include in the test manual the necessary data by which raw scores or IQ's can be changed to percentile scores or other meaningful deviation scores. Table 15.3, part of a larger table from the *Manual, California Short-Form Test of Mental Maturity, Elementary,* shows the percentile equivalents for the four main subtests, the Language and non-language parts of the test, and total. For example, raw scores of 16-18 in Language and of 31-32 in Non-Language are equivalent to the 50th percentile for children of 96-107 months. Other tables and descriptions in the same manual show how to use raw scores to arrive at mental age, IQ, grade equivalent, and how to change IQ to percentile scores. The important point is that, on the other group tests also, the percentile scores are more comparable from one test to another than are the IQ's. Thus, if one chose to identify all pupils in Grade 5 with IQ's at or above 115 he might identify many more pupils with one test than another; if he identified all pupils at or above the 85th percentile, he should get about the same number, regardless of test used.

TABLE 15.3. Percentile Norms—California Short-Form Test of Mental Maturity—Elementary—1957 S-Form (Age 8-0 to 8-11)

	Factor				Data		
Percentile	Spatial Relationships	Logical Reasoning	Numerical Reasoning	Verbal Concepts	Language	Non-language	Total[a]
99	33+	26+	13+	22+	37+	44+	137+
98	31–32	25	12	20–21	34–36	43	132–136
95	29–30	24	10–11	17–19	31–33	41–42	126–131
90	27–28	22–23	9	14–16	27–30	39–40	119–125
80	25–26	20–21	8	12–13	24–26	37–38	113–118
70	24	19	7	10–11	21–23	35–36	109–112
60	22–23	18	6	9	19–20	33–34	105–108
50	20–21	17	5	7–8	16–18	31–32	100–104
40	18–19	15–16	4	6	14–15	30	95–99
30	16–17	13–14	—	5	12–13	28–29	91–94
20	13–15	11–12	3	3–4	9–11	26–27	85–90
10	11–12	8–10	2	2	6–8	23–25	78–84
5	7–10	5–7	1	1	4–5	20–22	72–77
2	5–6	3–4	0	0	3	16–19	—
1	0–4	0–2	—	—	0–2	0–15	—

[a] Values in this column are reported as months of mental age. Values in other columns are in raw-score units.

SOURCE: Manual, California Short-Form Test of Mental Maturity, Elementary, 1957 S-Form, *Los Angeles: California Test Bureau.*

Items used in group tests of intellectual ability vary widely. Some are purely measures of educational achievement which supposedly all pupils have had equal opportunity to learn; other items are intended to be novel, met for the first time in the test. The seven sample items below, from *Pintner Intermediate Test: Form A, Verbal,* 1938, Tarrytown, World Book Company, are indicative of the type of item used in verbal group tests of intelligence.[2]

A. Choose the numbered word that means the same as the first word (the one without a number).

closed – 1 far 2 shut 3 open 4 long 5 up

B. Choose the numbered word that tells what the first word (the one without a number) always has.

A *table* always has–

1 flowers 2 tablecloth 3 legs 4 varnished top 5 vase

C. From the numbers with letters in front of them choose the one which should come next in the series of numbers given first.

1 2 3 4 5 6 – *a* 8 *b* 7 *c* 10 *d* 9 *e* 11

D. Choose the best answer.

Why do we use a knife? Because –

1. it looks bright. 2. it can be used to cut things.
3. it can be used to eat soup. 4. it is hard.
5. it is easy to hold.

E. Choose the word that does not belong with the others.

1 horse 2 dog 3 violet 4 pig 5 camel

F. Choose the word that means just the opposite of the first word (the one without a number).

up – 1 high 2 bottom 3 upper 4 down 5 far

G. Choose the word that is related to the third word in the same way as the second is related to the first.

Hat is to head as shoe is to what?

hat – head::shoe – 1 hand 2 foot 3 neck 4 sky 5 glove

Now follows brief information about some of the notable group tests of general intellectual ability. Though certain of the tests yield separate subtest scores, any test which combines all the subtest scores by any method is put in this category, for the total is a summary measure of general intellectual ability. Other tests are available besides the ones which follow; this discussion includes some of the more notable tests and presents sufficient information for the reader to arrive at an understanding of the scope and types of general intellectual ability tests.

California Test of Mental Maturity, (CTMM), 1957, Los Angeles, California Test Bureau. The series is comprised of six levels for Grades kgn–1, 1–3, 4–8, 7–9, 9–13, 10–16 and adults. Eight separate scores are obtained: memory, spatial relationships, logical reasoning, numerical reasoning, verbal concepts, language, nonlanguage, and total. The full test requires about one and one-half hours for administration; however, the Short Form, discussed previously, requires about two-thirds this time.

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Three IQ's are obtained—language, nonlanguage, and total. The total IQ is of most practical significance for usual school purposes. The subscores may be used to construct a profile but have uncertain diagnostic value. With forms from kindergarten through and beyond high school, the series provides the opportunity for a school system to maintain longitudinal records, based on the same concept of general ability. The overlapping of the levels, by grade, permits selection and use of two levels within the same grade to secure fairly adequate measures for the lower and higher IQ children who are in the same grade, e.g., sixth.

College Qualifications Tests (CQT), 1955–58, New York, Psychological Corporation. Six scores are obtained: verbal, numerical, science information, social science information, total information, and total; eighty minutes are required for administration. The tests are designed for measuring general scholastic aptitude of college applicants. Norms are available for the upper years of high school and also for various types of institutions. The verbal and numerical tests are similar to other group intelligence tests, but the informative tests are based more directly upon educational background. These tests have been carefully prepared, and one form is distributed only to colleges and universities. Relatively high correlations are reported between test results and college grades.

Cooperative School and College Ability Tests (SCAT), 1955-57, Princeton, N.J., Cooperative Test Division, Educational Testing Service. The series is in five levels for Grades 4–6, 6–8, 8–10, 10–12, 12–14. Seventy to ninety-five minutes are required for administration. Three scores are obtained—verbal, quantitative, and total. The tests are intended primarily to predict academic success; the items, much as in the CQT, measure abilities acquired in school. Whether the tests, particularly below the level for Grades 12–14, are highly reliable in discriminating high and low groups in ability is not completely assured. The tests have been carefully prepared but were released prior to the extended study which modern test construction generally demands. Research is continuous on these tests, and further studies of validity, stability, and discriminating power will probably be reported.

Henmon-Nelson Tests of Mental Ability, 1958, Boston, Houghton Mifflin Company. Three levels are available in the most recent revision for Grades 3–6, 6–9, and 9–12; an earlier edition is available at the college level. Thirty minutes are required for administration, and a single score is obtained. Though the tests are short, the correlations with standardized achievement test scores and with teacher grades in such areas as reading, English, mathematics, and science are much the same as those reported for single total scores obtained from other group tests. The Henmon-Nelson provides no diagnostic feature. As with tests generally intended to measure intellectual ability over a wide grade range, e.g., 3–6, the test is probably too difficult for low-ability students in Grade 3 and has insufficient top range for high-ability students in Grade 6. Most reliable results are obtained when such tests are administered to the middle group, e.g., Grades 4 and 5.

Kuhlmann-Anderson Intelligence Tests, Sixth Edition, 1952, Princeton, N.J., Personnel Press, Inc. There are nine main levels for Grades kgn, 1, 2, 3, 4, 5, 6, 7–8, 9–12, and the entire scale is comprised of thirty-nine tests, organized into nine booklets. The kindergarten booklet has tests 1–10; the first grade, 4–13; the second grade, 8–17; and so on. A class of pupils at a grade level and pupils within a grade can be given tests closely fitted to their abilities. A low-ability pupil in the second grade may be given the first-grade or even the kindergarten tests, and the high-ability pupil may be given the third- or even fourth-grade test. This is a desirable feature of the Kuhlmann-Anderson Tests over other tests which have only one test for the primary grades and another for the intermediate grades. When it is properly administered, IQs are secured that correlate high with the 1937 Stanford-Binet.

Lorge-Thorndike Intelligence Tests, 1954-57, Boston, Houghton Mifflin Company. Five levels of these tests are intended for Grades kgn–1, 2–3, 4–6, 7–9, 10–12. These tests were constructed on the basis of the authors' clearly stated concepts of intelligence; and correspondingly are nonverbal at the two lowest levels and both verbal and nonverbal at the other three levels. At the lower levels, items requiring verbal understanding and reasoning are read by the teacher, and the pupils respond by marking pictures. The tests are well constructed and are widely accepted. Their efficiency in predicting scholastic success compares favorably with other group tests.

Miller Analogies Test, 1952, New York, Psychological Corporation. This test is intended for superior adults and is widely used to measure academic aptitude at the graduate level. It consists of 100 highly difficult items and is administered only at licensed centers. When its results are combined with undergraduate grade-point average, fairly high correlations are reported for success in graduate work. Since the test is administered under high security precautions, fewer studies have been made on it than on widely used tests in the elementary grades and high school. Its use has increased steadily since the first edition was published in 1926.

SRA Tests of Educational Ability, 1958, Chicago, Science Research Associates. This series has three levels for Grades 4–6, 6–9, 9–12 and yields four separate scores for Grades 6–12: language, reasoning, quantitative, and total; the fifth separate score for Grades 4–6 is nonreading. Two other tests for lower levels are planned. Supposedly, the separate *L, R,* and *Q* scores have more value for predicting achievements in different subject fields than does the total score.

Single Special Aptitude Tests and Multiaptitude Batteries

Tests of general intellectual ability measure scholastic aptitude to the extent that they are effective in predicting success in certain subject fields in or outside the school. And it is established that the scores from group tests of general intellectual ability are not highly useful in predicting how most students enrolled in any school will perform in such classes or activities as vocal music, instrumental music, visual arts, handwriting, typing, physical activities, and leadership.

Test makers and others have been concerned for years with devising tests that will be better than the general intellectual ability tests in these areas. As discussed previously in Chapter 8, tests of psychomotor abilities—reaction time, arm-hand steadiness, balance, speed of various body movements, dexterity of various body parts, psychomotor coordination involving various body parts, and strength—have been devised, but their use in predicting performances in school subjects is exceedingly limited. Some research in this area was done in the education of Air Force personnel and certain tests are used in industry; we are now giving more consideration to this area of investigation in school situations.

The *Meier Art Judgment Test,* Grades 7–12, 1942, Bureau of Educational Research and Services, State University of Iowa; the *Horn Aptitude Inventory,* Chicago, C. H. Stoelting Company; *Seashore Measures of Musical Talents,* New York, Psychological Corporation; and the *Kwalwasser Music Talent Test,* New York, Mills Music, Inc., are representative of aptitude tests that intend to measure various abilities and/or affective characteristics which, in turn, will be useful in predicting success with further education. As yet, these single aptitude tests have proved most useful for research purposes and for making judgments about groups; they have not been found particularly reliable for decision making with individuals in the larger school population. At the present time, giving opportunity for education in the fine arts and other fields to all children and having competent teachers estimate the probability of success from further education are the usual practice. And though general intellectual ability does not correlate high with art or music achievements in the school population, it cannot be dismissed as one important factor. The multiple-aptitude tests, next discussed, typically measure a general intellectual ability or factor, or a group factor or factors, or specific factors. (See Chapter 17 for a further discussion of the meaning of factors.)

The Differential Aptitude Tests (DAT), 1958, New York, Psychological Corporation, consist of eight tests for use in Grades 8–12 and yield subscores as follows: verbal reasoning, numerical ability, abstract reasoning, space relations, mechanical reasoning, clerical speed and accuracy, and language usage—spelling and sentences. Each test requires from twenty-five to forty minutes to administer; approximately three sessions of eighty minutes each are required for the entire battery, including time for giving directions. A composite score from the first two tests provides a measure of general intellectual ability.

A profile is constructed from results of the eight tests. The raw scores are changed to percentile scores based on norms provided by the test publisher. These norms for all the subtests are based on the same standardized population; this is a distinct advantage over separate aptitude tests. Though not a perfect battery (and none yet is) for deciding with complete accuracy which students might profit most from instruction in certain academic subjects, stenographic courses, industrial arts courses, and the like, the battery results can be used by a counselor to confer with students in decision-making about a program of high school studies and also about subsequent occupational choices. Other information is also needed, of course, for making these decisions.

The *General Aptitude Test Battery* (GATB), 1958, Washington, United States Employment Services, is intended for persons age sixteen and over. The battery was developed for use in the occupational counseling program of the U.S. Employment Service and is now in wide use by State Employment Services. The battery is available for testing high school students and others through arrangements with the Employment Services; results are then available to the Employment Services and to the high school.

Eight paper-and-pencil and four apparatus tests are used to measure nine distinct abilities or factors: G—general reasoning ability, V—verbal aptitude or vocabulary, N—numerical aptitude, S—spatial aptitude, P—form perception, Q—clerical perception, K—motor coordination, F—finger dexterity, and M—manual dexterity. Continuous research is in progress throughout the United States (versions of the tests are being prepared in many foreign countries) for clarification of the relationships and patternings of scores with many occupations. Also, as more data become available, they are used to improve the battery. The entire battery is administered in two and one-half hours and the reliability of each test is quite high. As norms and related profiles are developed for an increasing number of families of occupations, and of more specific occupations, the GATB promises to be a highly significant contribution to vocational aptitude testing.

Other multiability and multiaptitude tests, published since 1954 and intended for use partly or entirely at the senior high school level, are: *Employee Aptitude Survey*, 1958, Los Angeles, Psychological Services, Inc.; *Flanagan Aptitude Classification Tests*, 1956, Chicago, Science Research Associates; *Holzinger-Crowder Uni-*

Factor Tests, 1955, Tarrytown, World Book Company; *Multiple Aptitude Tests,* 1955, Los Angeles, California Test Bureau; *SRA Primary Mental Abilities,* 1958, Chicago, Science Research Associates. The bases on which these tests have been constructed vary widely; none is exactly like either the DAT or GATB.

Single Tests and Batteries of Educational Achievement

Educational achievement tests intend to measure the extent to which pupils have acquired various outcomes of instruction. As suggested in Chapters 6-10, a large number of these outcomes in any subject field at any school level can be stated as facts, concepts, problem-solving abilities, and psychomotor and other skills. Further, attitudes and values, interests, motives, and methods of adjustment are also learned in school. The present discussion is devoted primarily to tests which measure outcomes in the cognitive domain; however, the teacher or any other person selecting tests of educational achievement should make certain of the relationship between the objectives of instruction and what is measured by the achievement test. If, for example, one wishes to ascertain the more specific concepts and processes in arithmetic related to a child's experiencing difficulty in reading or arithmetic, he will use a specially designed diagnostic test, not a general achievement test in reading or arithmetic. Similarly, if one wishes to ascertain the extent to which problem-solving abilities and concepts are being acquired in mathematics, one does not use a test which includes only computational exercises.

The early educational achievement tests measured knowledge and routine skills closely related to specific subject fields; they gave little attention to such outcomes as problem-solving abilities, understanding of principles, application of principles or knowledge, or evaluation of facts. More recent tests are attempting to measure the latter type of outcomes. However, the best tests currently available in any subject field or fields (and there are many excellent ones) should not be treated as providing complete evidence about the quality or effectiveness of the educational program of a school, or of a teacher's work in the school, or as an adequate basis for deciding what the objectives of instruction should be. Instead, they provide some evidence which fits into a balanced continuous evaluation program in which the objectives of education are stated clearly and a variety of teacher judgments and informal evaluation procedures is also used. In general, standardized achievement tests have been used too little to provide understanding of a pupil's present achievements and too much to categorize pupils and for grading.

Of all types of available group tests, achievement tests are the most valuable for use in a variety of school situations. They provide more direct information about each child's performances and abilities in relation to the school's central objectives than do any other currently available type of test, including those discussed in the previous sections. Further, one of the best sources of information to which a teacher can turn for finding models of well-constructed achievement test items is printed tests. Consider, for example, these items from Word Meaning, Arithmetic Reasoning, Science, and Study Skills tests of the *Intermediate Battery Complete, Form J, Stanford Achievement Test,* 1953, Tarrytown, World Book Company:[3]

Word Meaning

31. Animals that dig tunnels in the ground – *1* bellow *2* harrow *3* whittle *4* burrow
32. Trying to find out what makes things work is–*5* conscience *6* curiosity *7* position *8* motion
33. Things which are much alike are – *1* equal *2* handsome *3* similar *4* opposite
34. The growth and progress of a town is its – *5* development *6* vicinity *7* standard *8* founding

Arithmetic Reasoning

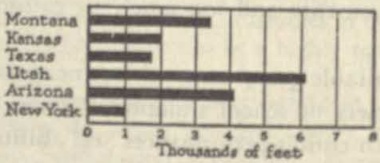
1. There are 8 apples on the table. If we eat 3 of them, how many will be left?
   a 3 *b* 5 *c* 8 *d* 24 *e* not given
2. Helen's mother has 28 cookies in the oven. There are 35 more to be baked. How many cookies will there be all together?
   f 7 *g* 35 *h* 63 *i* 100 *j* not given
3. Jane has 13 coloring pencils and Dot has 5. If Sue buys a box of 12 pencils, how many pencils will all three girls have?
   a 6 *b* 20 *c* 25 *d* 28 *e* not given
4. Judy has 16 jacks and Hazel has 9. How many more jacks has Judy than Hazel?
   f 7 *g* 9 *h* 16 *i* 25 *j* not given

Science

46. A material which does *not* conduct electricity makes a good – *5* fuse *6* circuit *7* insulator *8* magnet
47. The number of phases, or changes, of the moon shown on most calendars is – *1* two *2* four *3* six *4* eight
48. We know that gravity is not the same as magnetism, because gravity – *5* is weaker *6* will attract iron *7* affects all things *8* does not depend upon electricity
49. Pressure cookers are especially useful because they–*1* are not likely to explode *2* hold much food *3* develop high temperatures quickly *4* work well at sea level

Study Skills. Part I. Reading Charts and Tables.
Use the bar graph below in answering questions 1-5.

AVERAGE ELEVATION IN SIX STATES



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1. Which state has the highest average elevation?
   a Utah *b* Montana *c* Arizona *d* Kansas
2. What is the average elevation of Kansas?
   e 1000 ft. *f* 1500 ft. *g* 2000 ft *h* 3000 ft.
3. The highest average elevation is nearest—
   a 5750 ft. *b* 6000 ft. *c* 6500 ft. *d* 7000 ft.
4. The average elevation of Arizona is closest to that of—
   a Utah *b* Montana *c* Arizona *d* Kansas
5. How many of the states listed on the graph have average elevations of 2000 feet or more?
   a 1 *b* 2 *c* 3 *d* 4

Many other excellent types of items are found in the Stanford Achievement Tests. Information about some of the more widely used and notable educational achievement batteries is now given to illustrate the progress being made in this field.

California Achievement Tests, 1957, Los Angeles, California Test Bureau. The 1957 series is at five levels: lower primary for Grades 1–2, upper primary for Grades 3–4.5, elementary for Grades 4–6, junior high for Grades 7–9, and advanced for Grades 9–14. From 89 minutes for the lower primary to 163 minutes for the advanced battery are required for administration. Eleven separate scores are obtained: reading vocabulary, reading comprehension, reading total; arithmetic reasoning, arithmetic fundamentals, arithmetic total; mechanics of English, spelling, language total; battery total, and handwriting.

The battery is well constructed and the norms are derived from the sample also used for determining the California Tests of Mental Maturity norms; this permits comparison of achievement test scores of each pupil with that of other pupils having the same CTMM IQ scores. One limitation of this battery is the absence of science and social studies tests, particularly at the junior and senior high school levels. Although no data were available to the author at the time of writing concerning the reliability and validity of the new California Survey Series, new tests are available as follows: Introductory Science for Grades 7–9, Physical Science for Grades 7–10, Biological Science for Grades 7–10, Introductory American History for Grades 7–9, and Geography for Grades 7–9.

Iowa Tests of Basic Skills, 1956, Boston, Houghton Mifflin Company. This is a multilevel test for use in Grades 3–9, with specifically designated items for each grade level. The 1232 items for all grades are contained in a 96-page booklet. Though the test is continuous for all grades, the pupils in each grade begin and stop at different points. The tests measure generalized intellectual abilities and skills and thus do not provide separate measures of achievement in such content subjects as literature, general science, and geography. The skills are classed into five major areas: vocabulary, reading, language, work–study, and arithmetic; a total score is available for each. Various subtest scores are also available. This battery has had a long and successful history in the field of achievement testing and is one of the best available for the grade levels indicated, showing high curricular validity, high reliability, careful construction, and an adequate standardization population.

Iowa Tests of Educational Development, (ITED), 1958, Chicago, Science Research Associates. These tests are for Grades 9–13 and yield ten scores on nine subtests: understanding of basic social concepts, general background in the natural sciences, correctness and appropriateness of expression, quantitative thinking, ability to interpret reading materials in the social studies, ability to interpret materials in the natural sciences, ability to interpret literary materials, general vocabulary, subtotal, and use of sources of information. One form of the test is used in scholarship competition in the American College Testing Program, and is thus not available as are other forms. The tests meet the same high standards of test development as the Basic Skills Tests just described. Eight hours are required for administration.

Metropolitan Achievement Tests, 1959, Tarrytown, N.Y., World Book Company. These tests were being standardized during the 1958-59 school year and at the time of writing, the author did not have complete data on the tests. The 1946 edition was considered a noteworthy test, and it is assumed that the 1959 edition has made general improvements as have other achievement tests. The 1946 tests included separate batteries for Grades 1, 2, 3–4, 5–6, and 7–9, with subtests in reading, vocabulary, arithmetic fundamentals, arithmetic problems, language usage, punctuation and capitalization, literature, history, geography, science, and spelling.

SRA Achievement Series, 1957, Chicago, Science Research Associates. Three batteries are available for Grades 2–4, 4–6, and 6–9. Approximately seven hours is required for administration. There are four tests for Grades 2–4: language perception, arithmetic, language arts, reading. Eleven scores are obtained for Grades 4–6, 6–9: references, charts, reading comprehension, vocabulary, capitalization and punctuation, grammatical usage, spelling, arithmetic (3 scores), and total. The test is well constructed, somewhat along the lines of the *Iowa Tests of Basic Skills.*

Sequential Tests of Educational Progress (STEP), 1958, Princeton, N.J., Cooperative Test Division, Educational Testing Service. The batteries are for Grades 4–6, 7–9, 10–12, and 13–14, with seven subtests: reading, writing, mathematics, science, social studies, listening, and an essay test in English. The listening test is read to the pupils, and standardized instructions are given to the pupils to elicit the essay writing. The first five tests are administered in booklet form—the usual practice with achievement tests at these levels. These tests are intended to secure measures of the more generalized outcomes of formal and informal educational experiences, not of factual knowledge related to specific subjects. Comprehension, application, synthesis, and evaluation of information from the various subject fields and more generalized abilities are measured. Some inadequacies in the standardization procedures for these tests leave some question as to their discriminating power for high- and low-achieving students. Nevertheless, the items are well written and focus on the more generalized outcomes that many school people have desired in educational achievement tests.

Stanford Achievement Test, 1956, Tarrytown, N.Y., World Book Company. This series is in four batteries: Grades 1.9–3.5, 3–4, 5–6, 7–9, with administration times for the complete batteries being 110, 175, 260, and 260 minutes, respectively. The lowest battery yields 6 scores: paragraph meaning, word meaning, spelling, arithmetic reasoning, arithmetic computation, and total. The elementary battery for Grades 3–4 yields the same scores plus language; the intermediate battery for Grades 5–6 yields additional scores in social studies, science, and study skills; and the advanced battery the same ten scores as the intermediate battery. This test has a long history as a noteworthy achievement battery and the several revisions have shown consistent progress in test development.

The subtests in most achievement batteries are also available as separate tests or can be administered separately from a complete booklet. A large number and wide variety of tests are published as separates in the usual junior and senior high school subjects.

Interest Inventories

As stated in Chapter 11, interests tend to become stable during later adolescence. Also, expressed interest in an immediate activity in the classroom provides a favorable motivational set toward the activity. Though a teacher can readily ascertain the interests of students in immediate classroom activities, deciding which of many possible courses of study and occupations will be of interest over a period of time is a more difficult task. Interest inventories have been developed mainly to facilitate this type of educational and vocational decision-making.

In an interest inventory of many items, the respondent in a short time period checks his preferences for a large number of activities. In this manner, the preferences of the respondent to many activities can be compared with those of other individuals in the standardization populations. The administration of interest inventories is fully as standardized as administration of educational achievement tests. However, interpretation of interest inventories is not, especially for junior and senior high school students who are not yet in adult occupations and whose interests are still in the formative stage. This will become more apparent in the subsequent discussion of two notable inventories—the Strong Vocational Interest Blanks and the Kuder Preference Record.

The *Strong Vocational Interest Blank for Men, Revised,* 1927–1959, Palo Alto, Consulting Psychologists Press, Inc., is intended for use with males, age seventeen and over. There are 57 scoring scales (47 occupations, 6 occupational group scales, and 4 nonvocational scales.) The clusters for the 47 occupations and 6 occupational groups are as follows:

Group I: artist, psychologist, architect, physician, psychiatrist, osteopath, dentist, veterinarian (group scale).
Group II: physicist, chemist, mathematician, engineer (group scale).
Group III: production manager.
Group IV: farmer, carpenter, printer, mathematics–physical science teacher, policeman, forest service man, army officer, aviator.
Group V: Y.M.C.A. physical director, personnel manager, public administrator, vocational counselor, Y.M.C.A. secretary, social science high school teacher, city school superintendent, minister, social worker (group scale).
Group VI: music performer, music teacher.
Group VII: certified public accountant.
Group VIII: senior C.P.A., accountant, office worker, purchasing agent, banker, mortician, pharmacist (group scale).
Group IX: sales manager, real estate salesman, life insurance salesman (group scale).
Group X: advertising man, lawyer, author-journalist (group scale).
Group XI: president of manufacturing concern.

The four nonvocational scales are occupational level, masculinity–femininity, specialization level, and interest maturity.

In the Blank for Men the respondent encircles L to indicate a like for, I to indicate indifferent to, and D to indicate dislike for 400 activities incorporated in as many items, four of which (from p. 2 of the Blank) are:[4]

1. Actor (not movie) .... L I D
9. Author of novel .... L I D
10. Author of technical book .... L I D
11. Auto salesman .... L I D

The responses, usually on IBM Answer Sheets, are subsequently scored at various centers, where they can be processed electronically. In turn, the obtained scores are keyed according to the various occupational and other categories previously reported.

The Strong Vocational Interest Blank for Women, Revised, 1933–1959, is for age seventeen and over and has 28 occupational scales and 1 nonvocational scale as follows: artist, author, librarian, English teacher, social worker, psychologist, social science teacher, Y.W.C.A. secretary, lawyer, life insurance saleswoman, buyer, business education teacher, office worker, stenographer–secretary, housewife, elementary teacher, music performer, music teacher, home economics teacher, dietitian, college physical education teacher, high school physical education teacher, occupational therapist, nurse, mathematics–science teacher, dentist, laboratory technician, physician, and masculinity–femininity.

These Strong Vocational Interest Blanks have been widely used and the scoring keys, during the many years of continuous use and revision, were developed on the basis of correlations between the inventory scores and criteria. The criteria were drawn from responses of successful adults in the various occupations. This selection of items by trial-and-confirmation procedures enabled Strong to relate expressed preferences of respondents to the preferences of successful adults in specific occupations and in broad groups of occupations listed above.

Note that one Blank is for males and another for females. Certain fields of teaching are listed for both males and females; some, only for males; others, only for females. Though sex differences in interests are pronounced, males and females in the same teaching field, for example, mathematics, have more similar occupational interests than do males in architecture and males in Y.M.C.A. positions. Beyond this also, younger females, particularly, have a broad global interest in marriage and family that is quite different from interests of males; this has been a persistent and troublesome problem in devising and validating interest inventories for use with females (Tyler, 1956, p. 206).

The Kuder Preference Record–Vocational, Form C, 1934–1956, Chicago, Science Research Associates, is intended for use in Grades 9–16 and with adults. Form C yields scores related to ten clusters of occupational interests: outdoor, mechanical, computational, scientific, persuasive, artistic, literary, musical, social service, and clerical. The eleventh scale is masculinity–femininity. Not to be confused with this vocational inventory are *Form A,* a personality scale, and *Form D,* intended to yield scores related to more specific vocations.

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Kuder developed his inventory by a procedure almost opposite to that of Strong. As stated earlier, Strong keyed his inventory by relating it to interests of successful persons in various occupations. He was not concerned whether a group of items were interrelated but with how successful persons responded to items. Kuder began with factor analysis of items to identify clusters of interests, and then organized these related items into the ten descriptive scales noted above. Thus, the early scales were not validated against the interests of adults in the occupational fields. Many subsequent studies of these relationships have been completed and the inventory scores can be related to more specific vocations.

The items are so arranged that the respondent indicates which activity in a group of three he most likes and which he most dislikes. The range of activities is shown in only two sets of three used as practice items in the Kuder Preference Record, Form CH, Vocational; 1948:[5]

P. Visit an art gallery
Q. Browse in a library
R. Visit a museum

S. Collect autographs
T. Collect coins
U. Collect butterflies

The best use of the Kuder scores and profiles is to treat them as one source of information for helping the student to understand himself better in planning a high school and perhaps a post-high school program of study or work. At present, school people properly give much more weight to results from achievement and intellectual ability tests than to results from interest inventories in planning high school courses with the students.

Other interest inventories published in the United States but which require more caution in interpretation than the previous two are: *Brainard Occupational Preference Inventory,* for Grades 8–12 and adults, New York, Psychological Corporation; *How Well Do You Know Your Interests,* for Grades 13–16 and adults, New York, Executive Analysis Corporation; *Interest Check List,* for Grades 9 and over, Washington, United States Employment Service; *Inventory of Occupational Interests,* for Grades 7–16 and adults, Rockville Centre, N.Y., Acorn Publishing Company; *Occupational Interest Inventory (Lee-Thorpe),* for Grades 7–16 and adults and for Grades 9–16 and adults, Los Angeles, California Test Bureau.

Personality Inventories and Check Lists

Some theorists classify interest and intelligence as personality traits. In Chapter 1 such outcomes of learning as interests, motives, attitudes, values, and personality integration were put in the affective domain rather than in the intellectual or psychomotor. Also, in Chapter 10 it was pointed out that learned outcomes in the affective domain are related to efficiency of learning in the cognitive and psychomotor domains, and vice versa.

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Problems in personality testing are presented by Cronbach (1960, pp. 440–463), including such matters as the respondent's faking the answers, the concealing of the purpose of the test from the respondent, and ethical issues in personality testing. This last is of highest importance. Cronbach concludes:

> There remains the question of using personality tests when the tester has authority over the person tested. The psychologist diagnosing mental patients, the military psychologist, or the school teacher can enforce tests on his charges. The standards with regard to such practice probably should vary from institution to institution. In general, it seems that subtle tests may properly be used if they are valid and relevant in making decisions which would otherwise rest on less valid information. The tester should avoid misrepresentation in giving the tests. For example, it is quite improper to study an individual's beliefs under the guise of an opinion poll. Test records made for employee counseling should never be made available to the employee's superior [Cronbach, 1960, p. 462].

As we have become increasingly aware of and concerned with personality integration, a variety of published tests has appeared to appraise personality traits, personality organization, personal–social problems, personal–social adjustment, and other affective characteristics. Some of the more notable published instruments are described, to present the sweep of this movement at all age levels; also considerable attention is given to instruments used in research in teacher education, particularly those mentioned earlier in Chapters 4 and 5.

The *California Test of Personality,* 1953, Los Angeles, California Test Bureau, consists of five batteries for Grades kgn.–3, 4–8, 7–10, 9–16, and adults. Fifteen scores are obtained: self-reliance, sense of personal worth, sense of personal freedom, feeling of belonging, withdrawing tendencies, nervous symptoms, total personal adjustment, social standards, social skills, antisocial tendencies, family relations, school relations or occupational relations, community relations, total social adjustment, total adjustment.

The first two items of Form AA, 1953, Section 1A (self-reliance), from the kgn.–3, 4–8, and 9–16 batteries illustrate the type of self-report items used throughout the battery:[6]

Kgn.–3:

1. Is it easy for you to play by yourself when you have to? Yes No
2. Is it easy for you to talk to your class? Yes No

Grades 4–8:

1. Do you usually keep at your work until it is done? Yes No
2. Do you usually apologize when you are wrong? Yes No

Grades 9–16:

1. Do you often act as a leader when working with other people? Yes No
2. Is it easy for you to introduce or be introduced to people? Yes No

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The responses are scored and a profile is constructed, according to procedures outlined in the accompanying manual. Aids in interpreting the profile are also presented. The publisher intends the tests to be used primarily in understanding and guiding the individual more effectively. In this respect, the meaning of the profiles is not so clear as in the California Test of Mental Maturity and the California Achievement Tests, previously discussed. The same statement applies to all personality inventories in that we have not yet defined personality as clearly as we have intellectual abilities and educational achievements. The school system which uses this test or any other personality inventory would do well to carry out longitudinal research to ascertain the meaning of the scores and profiles.

The *Minnesota Multiphasic Personality Inventory* (MMPI), 1951, New York, Psychological Corporation, is intended for use with individuals of age sixteen and over; forms are available for administration to individuals and to groups. The original psychiatric scales incorporated in the *Inventory* and still used are hypochondriasis, depression, hysteria, psychopathic deviate, masculinity and femininity, paranoia, psychasthenia, schizophrenia, and hypomania. Besides these nine scales, there are four correction or control scores: a ? score indicates the total number of items omitted by the respondent; the L score indicates the total number of improbable answers given; the F score is the number of responses which are rarely given; and the K score is a correction key applied to certain of the psychiatric scale scores.

The instructions suggest that each statement be read and marked as being "true as applied to you" or "false as applied to you." Every statement is to be responded to; however, "If a statement does not apply to you or if it is something that you don't know about, make no mark on the answer sheet." Four items show the style but do not sample the content of the 561 items included in the 1943 form:[7]

1. I like mechanics magazines.
100. I have met problems so full of possibilities that I have been unable to make up my mind about them.
200. There are persons who are trying to steal my thoughts and ideas.
300. There never was a time in my life when I liked to play with dolls.

The MMPI has status among personal inventories similar to that of the Strong Vocational Interest Blanks in the field of interest testing and the Stanford-Binet Intelligence Scale in the field of general intellectual ability. Even so, the MMPI is not generally considered sufficiently valid in itself to provide a completely accurate diagnosis of an individual's personality or to predict adjustment of individuals over a period of time. At present, research with college students is in progress in the attempt to find patterns of scores which may serve such purposes as discriminating groups of freshmen who will graduate and who will not, who will be subsequently successful in a career and who will not, and who need immediate counseling or other therapy and who do not.

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The *Minnesota Teacher Attitude Inventory,* 1951, New York, Psychological Corporation, consists of 150 statements designed to sample opinions of prospective teachers and other school personnel about teacher–pupil relations. About 30 minutes are required for administration, and scoring is simple. To each statement, the person responds with: strongly agree, agree, undecided or uncertain, disagree, or strongly disagree. Four items are:[8]

1. Most children are obedient.
2. Pupils who "act smart" probably have too high an opinion of themselves.
5. Teaching never gets monotonous.
14. Young people are difficult to understand these days.

This inventory is one of few instruments designed to measure attitudes in relation to vocational success. The scoring is standardized and, on the basis of the scores obtained, one uses tables to convert raw scores to percentile ranks for such populations as beginning education juniors, graduating education seniors, experienced elementary teachers, and experienced secondary teachers. The concurrent validity as well as the scoring procedures are based upon responses of experienced teachers who were judged to show varying degrees of excellence in the management of teacher-pupil relations. Though this is the case, there are many disagreements about desirable attitudes toward various teacher–pupil relations. The school administrator or other person who might use the test for selecting teachers should first take it himself, learn how he scores, and then decide whether or not he might wish his candidates for teaching positions to respond as he does.

The *Mooney Problem Check List,* 1950, New York, Psychological Corporation, has four different forms: Grades 7–9, 9–12, 13–16, and adults. The *Problem Check List* is not a test. It does not measure the scope or intensity of student problems whereby a test score is obtained, nor is there a profile. Instead the student responds to a list of troublesome problems which often face the student—problems of health, money, social life, home relations, religion, vocation, schoolwork, and the like. Each problem is to be read slowly and underlined if it is a problem; then the student goes back over the problems that have been underlined and encircles the ones that are most troublesome. Finally, he answers some summarizing questions.

Five items from the High School Form, 1950, indicate some of the types of problems contained in the entire list:[9]

1. Being underweight.
30. Worrying.
130. Wondering if I'll find a suitable mate.
230. Ashamed of the home we live in.
330. Poor assemblies.

The results are useful in facilitating counseling interviews, in making group surveys leading to plans for individualized action with a student, as a basis for guidance programs of the homeroom and orientation type, as a means of increasing teacher understanding of students in regular classroom situations, and in conducting research on the problems of youth. When students know that their responses will be kept confidential and that they will be given assistance with the problems that they have checked as troublesome, they tend to respond freely and frankly. Not intended as a refined measure of any aspect of personality, the check list can be used by teaching staff and counselors to good advantage, provided they know how to use it and are able to help the student with the problems he reveals.

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The *SRA Junior Inventory,* 1957, *Form S,* Chicago, Science Research Associates, for use in Grades 4–8, yields five scores: school, home, myself, people, and health. The *SRA Youth Inventory, Form S,* 1956, by the same publisher, for use in Grades 7–12, yields nine scores: school, future, myself, people, home, dates and sex, health, general, and special problems. In both instruments, the student responds to problems in much the same way as outlined in the *Mooney Problem Check List.* However, the responses may then be scored. To serve purposes like those outlined for the *Mooney Problem Check List,* these instruments have merit; interpretation of the scores appears difficult and most users would probably want to use the inventories as check lists rather than score the responses to secure profiles.

The *Study of Values,* 1960, Boston, Houghton Mifflin Company, is used with later adolescents and adults, primarily college students. It aims to measure the relative prominence of six basic interests or motives in personality: theoretical, economic, aesthetic, social, political, and religious. The test consists of a number of questions, based upon a variety of familiar situations to which two alternative answers are required in Part I of the test and four alternative answers in Part II. For example, in Part I one may agree with alternative (a) and disagree with (b), agree with (b) and disagree with (a), have a slight preference for (a) over (b), or have a slight preference for (b) over (a). The first three items from Part I of the test are:[10]

1. The main object of scientific research should be the discovery of truth rather than its practical applications. (a) Yes; (b) No.
2. Taking the Bible as a whole, one should regard it from the point of view of its beautiful mythology and literary style rather than as a spiritual revelation. (a) Yes; (b) No.
3. Which of the following men do you think should be judged as contributing more to the progress of mankind? (a) Aristotle; (b) Abraham Lincoln.

The responses are then scored and plotted to yield a profile. Figure 15.4 shows the profile of values for average males and average females and indicates the region of average, high, and low scores; further information to facilitate interpretation is provided in the accompanying manual. The *Study of Values* is widely used in psychological and educational research and in counseling and interview sessions with individuals.

The *Survey of Study Habits and Attitudes,* 1953, New York, Psychological Corporation, is an inventory of study habits and attitudes for use with college students. The intent is to promote self-understanding in the student taking it and to provide information which can be used in counseling with the student. In responding, the student checks each item R, rarely, meaning from 0 to 15 percent of the time; S, sometimes, meaning from 16 to 35 percent of the time; F, frequently, meaning from 36 to 65 percent of the time; G, generally, meaning from 66 to 85 percent of the time; and A, always, meaning from 85 to 100 percent of the time. The first three of 75 items are:[11]

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1. I feel that teachers do not understand the student's problems.
2. My dislike for a certain teacher causes me to neglect my school work.
3. I feel that I would study harder if I were given more freedom to choose courses that I like.

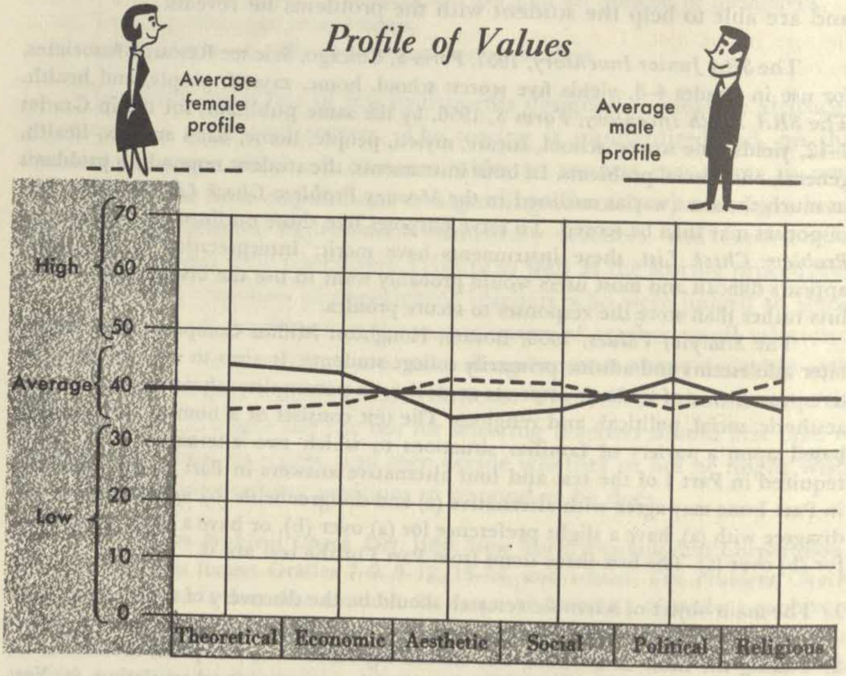

FIGURE 15.4. *(From* Study of Values, *Boston: Houghton Mifflin Company, 1960, p. 12.)*

Projective Tests of Personality

A projective test is a relatively unstructured, yet standard, situation to which a testee is asked to respond, but with as few restrictions as possible upon the mode or content of response. The purpose of projective testing is to ascertain the respondent's characteristic mode of behavior, including attitudes, motivations, or dynamic personality traits by observing his behavior in response to some standard stimulus. Although teachers and others at times use simple projective devices to elicit pupil responses, the three principal projective tests—the *Thematic Apperception Test,* Tarrytown, World Book Company; the *Children's Apperception Test,* New York, C.P.S. Company; and the *Rorschach Ink Blot Test*—are administered only by well-edu-

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cated psychologists or psychiatrists. Interpretation of the responses is highly dependent upon the experience of the examiner. Though these projective tests are used widely in clinical situations, their status is more dubious at present than it was some fifteen to twenty years ago.

The *Rorschach Ink Blot Test,* 1921–1957, New York, Grune & Stratton, Inc., is a projective test for use with individuals, age three and over. There are many adaptations and revisions; the original test consists of ten ink blots of varying colors and irregular forms. The subject is shown the ink blot and asked to tell what he sees in the blot. The trained clinician questions and encourages the subject to respond.

Upon securing the responses, the clinician follows one or another fairly objective procedure for deriving scores from the obtained responses. Generally, the scores fall into three major categories: location, determinants, and content. The location of the response refers to whether the whole blot, subdivisions, or unusual details of it were responded to. Determinants take into account the shape, color, and shading of the blot to which the subject responded. Content refers to whether the subject saw in the blot a person or persons, parts of persons, clothing, an inanimate object, and the like. On the basis of these responses, the clinician infers the total personality organization of the individual and some of the possible perceptions of the individual to self and to others which may be related to one or more facets of his personality organization.

In a hospital or other diagnostic and treatment center, the psychologist, psychiatrist, social worker, and others use all the information each has collected, confer about the individual, and arrive at decisions as to the present status of the individual's psychological health, the need for further diagnosis, possible forms and duration of treatment, possible release date, and the like. Many institutions rely quite heavily upon Rorschach data in diagnosis of personality disorders, even though attempts to score and interpret the Rorschach responses objectively have not proven completely successful.

Hertz summarized interpretation of the Rorschach thus:

> . . . it should be noted that the final analysis in the procedure of the interpretation in terms of other clinical and test data defies standardization, as Rorschach originally contended. The information gleaned from the Rorschach material is projected against family background, education, training, health history, past life, qualitative judgments of the examiner and of other people, and other clinical and test data. This is then interpreted in terms of the examiner's experiential knowledge of the dynamics of human behavior. Final conclusions are made by inference and analogy depending upon the experience, ingenuity, the fertility of insight, and, not to be forgotten, the common sense of the examiner. Prolonged and extensive experience is necessary, not only with human personality but with all kinds of clinical problems. This last step by definition, therefore, is personal to the examiner and subjective in him. It permits of no norm, and it eludes all standardization [Hertz, 1942, p. 538].

Four recent reviewers of the Rorschach indicate skepticism about continued heavy reliance on this test by clinicians and suggest the need for more refined measures of personality organization and dynamics. One of the reviewers, L. F. Shaffer, indicates, however, why it may receive continued use:

> In view of the relatively unfavorable evidence, why is the Rorschach held in such high esteem? Without attempting to be comprehensive, three reasons may be suggested. First, we have an intense need for a subtle and comprehensive instrument to assess personality. As recent research in social psychology shows, motivation and belief are highly related. When one has a strong need, evidence of little objective merit may be perceived as conclusive. Second, the Rorschach is projective for the examiner as well as for the examinee. One readily "reads into" the vague verbalizations of the Rorschach protocol all that one already knows and believes about the examinee. For each individual examiner, therefore, the Rorschach seems to confirm his other knowledge and he has an intuitive and personal sense of the validity of the instrument. Third, the Rorschach is not wholly without validity—it is sometimes "right" [Buros, 1959, p. 288].

SUMMARY

The main purpose in evaluating and measuring are to (1) help the student progress in learning tasks, (2) ascertain how well the student is learning, (3) understand the abilities and other characteristics of students, (4) facilitate self-understanding and self-evaluation by the student, (5) judge the effectiveness of the instructional and related programs, (6) assist in making curriculum and administrative judgments, and (7) extend knowledge about human abilities and teaching–learning processes. A good evaluation procedure or instrument is valid, reliable, and useable.

Standardized tests are widely used in evaluating the outcomes of instruction and in assessing abilities and other characteristics of students. The good standardized test is valid, reliable, and useable. Also, the method of administration and the scoring are standardized, and norms are available in the test manual whereby scores of individuals and groups can be interpreted in relation to the standardization sample.

Commonly used published tests include individual and group tests of general intellectual ability, single and multiaptitude tests, single tests and batteries of educational achievement, interest inventories, personality inventories and check lists, and projective tests of personality. Group tests of general intellectual ability, of aptitude, and of educational achievement are usually intended to be administered and interpreted by teachers. Other tests and inventories generally require more preparation by the person who does the administration, scoring, and interpreting; some personality tests require a large amount of specialized education.

QUESTIONS AND ACTIVITIES

1. (a) List and discuss briefly the three purposes of evaluating and measuring which have been achieved best in your college classes.
   (b) State and discuss the three which you think should receive most emphasis in your college classes.

2. (a) Discuss the test results which have been most helpful to you in self-evaluation.
   (b) Discuss other evaluation procedures which have been helpful to you in self-evaluation.
3. (a) What is the difference between content and predictive validity?
   (b) What is the relationship between reliability and validity?
4. (a) What are the main characteristics of standardized tests?
   (b) Which of the same characteristics are most difficult to incorporate in a test you might construct?
5. Referring to the appropriate references as necessary, compare Terman's and Wechsler's conceptions of intelligence.
6. (a) What are the advantages of the individual intelligence test in comparison with the group test of general intellectual ability?
   (b) Why are individual intelligence tests administered to fewer individuals than group IQ tests?
7. Secure test manuals and test copies for at least two group tests of general intellectual ability and compare them on the characteristics set forth previously for standardized tests.
8. In what respects are the Differential Aptitude Tests and the General Aptitude Test Battery alike? Different?
9. Would you use a group test of general intellectual ability or educational achievement tests to predict subsequent achievements of eighth-graders in high school English, social studies, science, and mathematics? Why?
10. What are the limitations of educational achievement tests?
11. (a) What values may accrue from the use of interest inventories?
    (b) In what respects are the Strong Vocational Interest Blank for Men and the Kuder Preference Record–Vocational alike? Different?
12. Why must school people exercise more caution in the use of personality tests than educational achievement tests?
13. What factors have led to the wide use of interest and personality inventories in the schools?
14. What are the strengths and limitations for school use of the Mooney Problems Check List in comparison with a personality inventory?
15. Why should the teacher understand the purpose and the use of the Rorschach Ink Blot Test?

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Chapter 16 Teacher-Made Tests and Informal Evaluation Procedures

Evaluation is a continuous process of securing and interpreting information to ascertain the quality and amount of student progress toward educational objectives. Evaluation helps students and teachers appraise their strength and weaknesses, plan more intelligently, make progress, and measure that progress. A comprehensive evaluation program requires various instruments such as the standardized and other published tests discussed in Chapter 15, teacher-made tests, and informal procedures of many types. You may review briefly the purposes of evaluation and the characteristics of a good evaluation procedure reported in the first sections of Chapter 15 before considering: (1) teacher observation and rating of performances; (2) paper-and-pencil objective tests of achievement; (3) essay tests; (4) self-reporting devices; (5) projective techniques.

OBSERVATION AND RATING OF PERFORMANCES

The teacher is with the student each day for many days during the semester or year. By observing the pupils as they engage in various learning activities, the teacher gains important information about such things as future plans of the pupils; the quality of performance in art, swimming, typing, and many other areas; the conduct of the pupil; level of motivation and interest in school activities; attitudes toward classmates, teachers, and self. It is exceedingly difficult, if not impossible, to obtain published tests or to devise paper-and-pencil tests to secure this type of information as reliably as it can be secured through systematic observation of daily performances.

Types of Informal Observation and Rating

Teachers are not interested only in observing pupil performances; in many school systems they are required to rate and to report their ratings to the students, parents, and school officials. Frequently the school system incorporates its objectives in the report form submitted to the student and parents. Though the main purpose of teacher observation and subsequent rating of performances is not to provide information to the students or parents, two excellent report forms are now presented and discussed, to illustrate the variety of evaluative information the teacher is expected to provide.

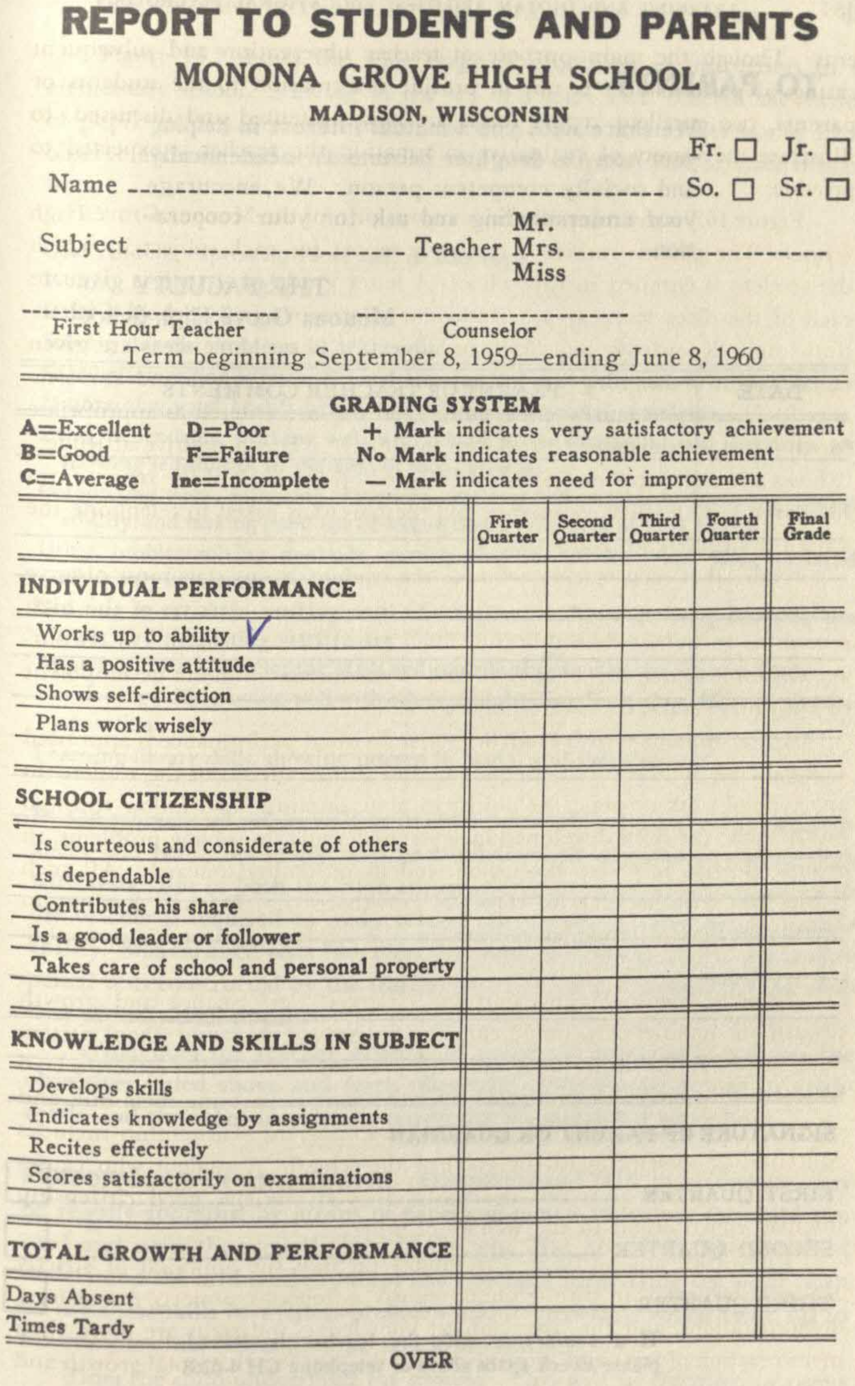
Figure 16.1 is the comprehensive report form of the Monona Grove High School. The parents receive a quarterly report for each subject in which the student is enrolled in this school. A letter grade of *A* to *F* is given in each of the three main areas: "Individual Performance," "School Citizenship," and "Knowledge and Skills in Subject." These three areas are given equal weight in assigning the letter grade for "Total Growth and Performance." The various marks—plus, minus, and no—are entered as appropriate for the thirteen subareas: "Works up to ability," "Has a positive attitude," "Shows self-direction," etc. Space is provided on the back of the report form for parent and teacher comments, and the parent is asked to telephone the school if a conference is desired.

Notice that each teacher who has the student in his class must observe and rate behavior in connection with the three main objectives of the high school: to encourage desirable individual growth in each pupil, to encourage desirable citizenship behaviors, and to encourage optimum development of knowledge and skills in the subject.

At the Monona Grove High School, individual performance is appraised as a valuable indication of the present and future success of the student in any type of work or play; the ability to plan, organize, and follow through on the plan; the skills developed in supervised study, in solving problems, in group research, in group discussion, and in individual research. All such habits and skills are part of the total growth of the students. Evaluation in this area has a tendency to measure the student against his *own* ability.

School citizenship represents the observed performance and growth toward the qualities of a competent, cooperative, participating school citizen. Such factors as care of personal and school property, the ability either to lead in worthwhile activities, or to take an active part in carrying them out, and effective cooperation in group projects are important. Citizenship includes contributing something to the good of the school. A student who causes no trouble in school is not necessarily a good student; good citizenship involves contribution to the welfare of others.

Knowledge and skills in the subject include the appraisal of strictly academic achievement through tests, reports, notebooks, projects, discussions, demonstrations, and the like. Subject knowledge and skills are more than memorization of facts and acquisition of skills, but less than total growth and performance related to all the educational objectives.



REPORT TO STUDENTS AND PARENTS

MONONA GROVE HIGH SCHOOL

MADISON, WISCONSIN

Fr. ☐ Jr. ☐
Name ____ So. ☐ Sr. ☐

Subject ______________________ Teacher Mr. / Mrs. / Miss ____________________

________________________ ____________________________
First Hour Teacher Counselor

Term beginning September 8, 1959—ending June 8, 1960

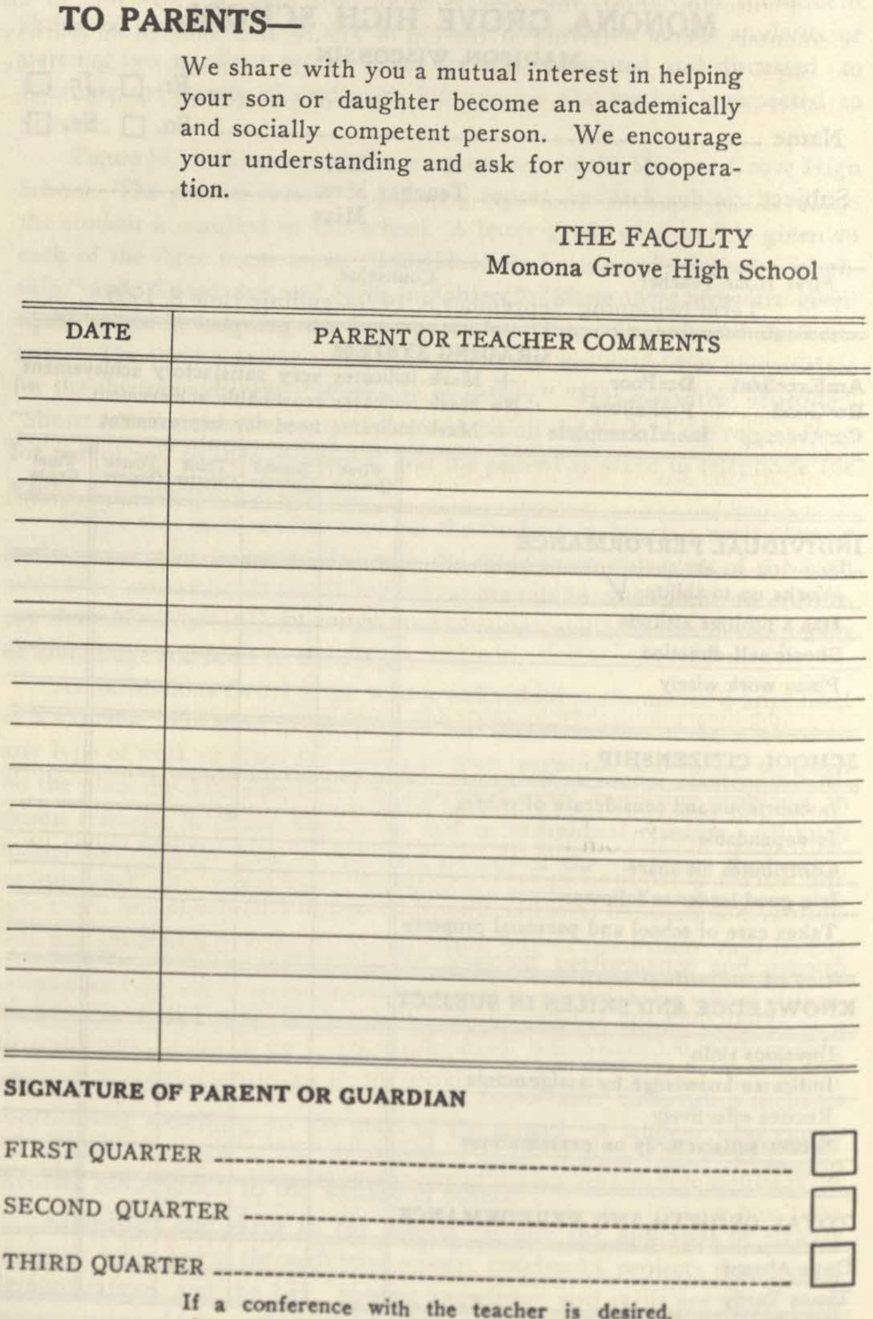
GRADING SYSTEM

A=Excellent **D**=Poor **+ Mark** indicates very satisfactory achievement
B=Good **F**=Failure **No Mark** indicates reasonable achievement
C=Average **Inc**=Incomplete **— Mark** indicates need for improvement

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Final Grade
INDIVIDUAL PERFORMANCE					
Works up to ability ✓					
Has a positive attitude					
Shows self-direction					
Plans work wisely					
SCHOOL CITIZENSHIP					
Is courteous and considerate of others					
Is dependable					
Contributes his share					
Is a good leader or follower					
Takes care of school and personal property					
KNOWLEDGE AND SKILLS IN SUBJECT					
Develops skills					
Indicates knowledge by assignments					
Recites effectively					
Scores satisfactorily on examinations					
TOTAL GROWTH AND PERFORMANCE					
Days Absent					
Times Tardy					

OVER

FIGURE 16.1. Report Form (Side 1) of the Monona Grove High School, Madison, Wisconsin



TO PARENTS—

We share with you a mutual interest in helping your son or daughter become an academically and socially competent person. We encourage your understanding and ask for your cooperation.

THE FACULTY
Monona Grove High School

DATE	PARENT OR TEACHER COMMENTS

SIGNATURE OF PARENT OR GUARDIAN

FIRST QUARTER -- ☐

SECOND QUARTER --- ☐

THIRD QUARTER --- ☐

If a conference with the teacher is desired, please check space above or telephone CH 4-6268

Figure 16.1 *(Continued).* Report Form (Side 2) of the Monona Grove High School, Madison, Wisconsin.

Figure 16.2 shows the wide range of objectives of instruction in an elementary school. Starting at the top of Figure 16.2, observe the variety of pupil performances and other behaviors which the teacher would likely observe and rate rather than using any form of published or teacher-made tests:

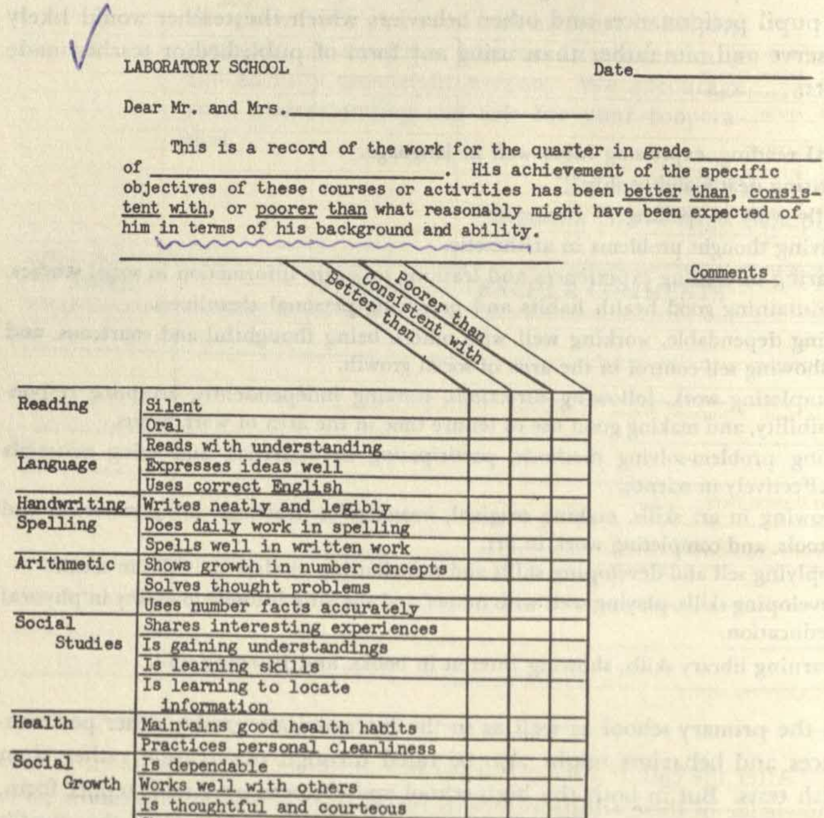
Oral reading, expressing ideas well in language.
Writing neatly and legibly.
Daily work in spelling.
Solving thought problems in arithmetic.
Sharing interesting experiences and learning to locate information in social studies.
Maintaining good health habits and practicing personal cleanliness.
Being dependable, working well with others, being thoughtful and courteous, and showing self-control in the area of social growth.
Completing work, following directions, working independently, accepting responsibility, and making good use of leisure time in the area of work habits.
Using problem-solving methods, participating in activities, and using materials effectively in science.
Growing in art skills, making original, imaginative drawings, using materials and tools, and completing work in art.
Applying self and developing skills and contributing to class activities in music.
Developing skills, playing well with others, and showing leadership ability in physical education.
Learning library skills, showing interest in books, and listening well.

In the primary school as well as in the intermediate grades, other performances and behaviors might also be rated through observation rather than with tests. But in both the high school and elementary school report form, the teacher is required to make certain ratings on the basis of the pupil's ability. Standardized tests like those discussed in Chapter 15 and paper-and-pencil tests constructed by the teacher are often used in estimating the abilities of individual pupils.

What does the teacher observe in order to help pupils acquire the objectives stated above and learn efficiently? Two examples, one in arithmetic and the other in science, clarify the observational procedures.

PERFORMANCE IN ARITHMETIC. Computational skill in arithmetic may be readily appraised by means of paper-and-pencil tests once the child can read and write the symbols used in the test. But how well does the child understand the arithmetic concept and processes underlying the skill? Can he use these skills in written problems and in problems which come up in his everyday life? How does he attack problems?

Does the child understand the process? This will be discussed in terms of a procedure for appraising and understanding the process of multiplication; the procedure may be applied to other arithmetic concepts and processes.



LABORATORY SCHOOL Date________________

Dear Mr. and Mrs.______________________________

This is a record of the work for the quarter in grade________ of ______________________. His achievement of the specific objectives of these courses or activities has been better than, consistent with, or poorer than what reasonably might have been expected of him in terms of his background and ability.

		Better than	Consistent with	Poorer than	Comments
Reading	Silent				
	Oral				
	Reads with understanding				
Language	Expresses ideas well				
	Uses correct English				
Handwriting	Writes neatly and legibly				
Spelling	Does daily work in spelling				
	Spells well in written work				
Arithmetic	Shows growth in number concepts				
	Solves thought problems				
	Uses number facts accurately				
Social Studies	Shares interesting experiences				
	Is gaining understandings				
	Is learning skills				
	Is learning to locate information				
Health	Maintains good health habits				
	Practices personal cleanliness				
Social Growth	Is dependable				
	Works well with others				
	Is thoughtful and courteous				
	Shows self-control				
Work Habits	Completes work				
	Follows directions				
	Works independently				
	Accepts responsibility				
	Makes good use of leisure time				
Science	Uses problem solving method				
	Participates in activities				
	Uses materials effectively				
Art	Growth in art skills				
	Original, imaginative drawings				
	Use of materials and tools				
	Completes work				
Music	Applies self to problem at hand				
	Is developing skills				
	(1) Vocal				
	(2) Instrumental				
	Contributes to class activities				
Physical Education	Is developing skills				
	Plays well with others				
	Shows leadership ability				
Library	Is learning library skills				
	Shows interest in books				
	Listens well				

FIGURE 16.2. Report Form of the Ernest Horn Elementary School, Colorado State College, Greeley, Colorado.

HABITS

	Periods		
	1	2	3
ATTENTIVENESS			
1. Follows directions			
2. Is a good listener			
3. Attitude			
COOPERATION			
1. Is familiar with essential courtesies			
2. Respectful of others			
3. Respectful of private and public property			
WORK HABITS			
1. Works well independently			
2. Completes assignments			
3. Uses leisure time wisely			
RELIABILITY			

Key to Marks: S–Satisfactory Progress I–Improving U–Unsatisfactory Progress

CONFERENCE DATE: ____________________

PARENT'S COMMENTS:

TEACHER'S COMMENTS:

After the children have learned to add objects in groups of two, their knowledge of these addition facts is incorporated in a multiplication table in three steps:

One 2	= 2	$2 + 0 = 2$	$1 \times 2 = 2$
Two 2's	= 4	$2 + 2 = 4$	$2 \times 2 = 4$
Three 2's	= 6	$2 + 2 + 2 = 6$	$3 \times 2 = 6$
Four 2's	= 8	$2 + 2 + 2 + 2 = 8$	$4 \times 2 = 8$
Five 2's	= 10	$2 + 2 + 2 + 2 + 2 = 10$	$5 \times 2 = 10$
Six 2's	= 12	$2 + 2 + 2 + 2 + 2 + 2 = 12$	$6 \times 2 = 12$

When and how should the child's understanding that multiplication is a process of addition be appraised? The most appropriate time is when the concept is being taught, for unless appraisal is made at this time, the teacher cannot determine whether more work is needed. Direct observation of the children when they are engaged in the activity is the best appraisal method.

Can the child use his computational skills and understanding of processes in solving problems? The teacher says to the class: "We have $5.00 to spend for our birthday party. Mary's committee has spent 39¢ for decorations. Bob's committee says that two gallons of ice cream will cost $3.00, and 5 dozen cones will cost $1.25. Susan's committee wants to buy 5 dozen fancy napkins. They cost 5¢ a dozen. Have we enough money for all this? Each of you work on this to see if there is enough money, how much will be left over, or how much more we need." Children attempt solution of the problem, working in pairs with the teacher observing their work. One child then writes the correct solution on the chalk board and explains how he arrived at the solution. Here, too, the teacher observes the explanation. Observation and related guidance in many situations like these aid children in applying computational skills to real problems and provide the means whereby the teacher can observe the extent to which the children are learning application of those skills.

To determine how the child attacks problems, the teacher observes him in situations like that above. How he goes about getting a solution is also checked carefully in his written work. In the above example, one child may first multiply 5 × 5¢ to get 25¢, the cost of the napkins, and then add 39¢, $3.00, $1.25, and 25¢, for a total of $4.89. Subtracting this from $5.00 gives the remainder of 11¢. There are numerous possibilities of making errors in computation and in method of attack in this problem. The method used may be appraised by careful observation.

The teacher can help the children improve their attack on both oral and written problems by asking such questions as: What is the problem? What do we want to find out in this problem? What should we do first? What is our next step? How can we check whether our answer is correct? In addition to discussing such questions orally the teacher can observe as the answers are applied in a variety of situations. In the process the correct or appropriate method is approved or reinforced and possible errors are identified and corrected.

PERFORMANCE IN SCIENCE. Assume that two objectives of science instruction are to build problem-solving techniques and to develop a scientific attitude toward the solution of problems. How do informal observation and related guidance assist pupils in acquiring problem-solving techniques and scientific attitudes?

Early in the year, the fourth-grade children and their teacher identify the problem: How can soil be conserved? This leads to a discussion of the social implications of erosion. The teacher proposes that the class first study soil formation so that they will understand better what causes erosion.

The children engage in such activities as making dirt by sandpapering rock, stirring coarse sand and pebbles together in a large jar of water, putting a water-soaked porous rock into a plastic bag and freezing it in the refrigerator, and taking a field trip to see how tree roots break the pavement.

When the children understand how to sandpaper the rocks, the teacher asks: "What are we looking for?" and this leads to a statement of the problem. The teacher helps the children develop skill in stating it and also sets the stage for more careful observation as the experiment proceeds. The rocks may be weighed before they are sandpapered, and later the rocks and dirt may be weighed, if the children are ready for this more technical instruction and if sufficiently accurate scales are available.

When the coarse sand and pebbles are stirred in the water, the children notice that only the sand moves when the water is stirred slowly, but that both sand and pebbles move when it is stirred rapidly, and that the heavier particles remain toward the bottom. "How does this form soil?" asks the teacher. Observant Harry says that stirring the water did the same thing as sandpapering the rock. Everyone agrees that this is good observing, and the ensuing discussion leads to the writing of preliminary guides for observation.

"The water dissolved some sand, didn't it?" This question from Pamela is pursued further to determine whether the coarse grains of sand and pebbles really dissolved or whether they broke into finer particles by striking against each other. Pamela has identified a more complex problem which the teacher points out and discusses with the class.

Chester suddenly wants to know what makes deltas. "Does the water make the soil or just carry it?" The children are now exhibiting a scientific attitude; they want to find correct answers. The teacher observes the attitudes each child expresses. She makes a point of encouraging the children to discover the answers for themselves. "I am not sure exactly what the answers to these questions are. We need more information. We know that when rocks are carried by water and strike against each other they chip and break. How can we find out if water really makes the larger particles dissolve? How can we find out how deltas are formed?"

The discussion which now begins leads to further research. It is decided that one group of children will repeat the water-stirring experiment using only washed sand and pebbles, and another group will have water trickle slowly down a small mound of dirt, coarse sand, and pebbles. The children who want to find out more about deltas are referred to appropriate reading materials.

Before any of this work is begun, each child is asked to write out what the problem is and how he intends to get further information and record his results. This is handed in for the teacher's appraisal and then returned to the child, with appropriate suggestions. Throughout all these activities, the teacher gives individual help and group guidance in observing carefully and recording accurately, working with the children continuously. When results of the experiments and reading are reported to the class, the class notes facts on which there is agreement and those on which there is disagreement; the latter are discussed further. Thus, a child whose information is inaccurate learns not only that it is inaccurate, but what he can do to correct it.

By means of careful observation the teacher appraises and may rate the pupil's growth or present status in problem-solving techniques and a scientific attitude. This appraisal is not postponed until the end of a unit, semester, or year; instead it begins as soon as the development of problem-solving techniques and a scientific attitude are identified as objectives of science instruction. It receives special emphasis when a problem is identified and it remains an essential component of an effective, progressive teaching–learning situation.

These descriptions of observing and rating in arithmetic and science imply that the characteristics or criteria of a good performance are known to the teacher and serve to guide the observation and rating. This is, of course, true for evaluating all performances: the making of a garment or preparation of food in home economics, diving or hitting a baseball in physical education, writing a story or giving a talk in the language arts, learning to speak a foreign language, or making a map or display in social studies. The teacher's observation and guidance are helpful to the extent that the teacher knows the characteristics of effective performance by students of the particular age or grade level.

Rating Scales

A rating scale provides a means for putting the results of observation in numerical form. The simplest rating scales indicate two degrees, e.g., "excellent" and "poor." More discriminating scales use more ratings—as many as the rater can reliably differentiate.

The main factors which determine the objectivity and accuracy of ratings are the exactness with which a performance being rated is defined, the discrimination with which the various ratings are made, and the competence of the person performing the rating. A scale may be devised for rating any performance—a theme, a painting, the playing of a musical instrument; and for rating conduct—behavior toward the opposite and own sex, domination and withdrawal, and the like. A comprehensive rating scale used in a controlled experiment and another rating scale of creativity will illustrate the form and use of rating scales.

In the Racine, Wisconsin, Public Schools, a controlled experiment was designed in 1959-1960 to ascertain the effects of acceleration on pupils presently enrolled in the second grade. First, the entire child population of the second grade was given a group intelligence test and the scores were changed to percentile scores. Next, the second-graders above the median age of all the pupils enrolled in the second grade whose scores were at or above the 82nd percentile were identified, and those who were at the 99th percentile and above in the younger age group were identified. This was the first screening to find those who might profit most from acceleration. Each child so identified was then rated by his teacher, using the scale shown on pages 493-495. Each teacher was invited to nominate other children whom they

RACINE PUBLIC SCHOOLS
TEACHER RATING SCALE OF SECOND GRADE CHILDREN

Child's Name ____
Teacher ____
School ____
Date ____

DIRECTIONS: This form is to be used to secure your appraisals of second-grade children who might qualify for acceleration. The child whose name is listed above has already met certain age and IQ criteria and will subsequently be given an achievement test. Place a check (✓) in the space to the left of the subitem which most adequately describes the child. Use only one check for each item. Not all items carry equal weight. As a guide for rating in some of the areas, you may wish to refer to *Explanatory Sub-Statements for Knowledge and Skills of Reporting Pupil Progress, Teachers Handbook, Second and Third Grades,* Racine Public Schools (pp. 10–19).

1. *Artistic Ability* (Shows growth in expressing ideas creatively. Uses art materials with care and understanding.)

________ Outstanding
________ Above average
________ Average
________ Below average

2. *Musical Ability* (Responds to and enjoys music. Shows growth in musical activities.)

________ Outstanding
________ Above average
________ Average
________ Below average

3. *Dramatic Ability* (Is expressive and enjoys dramatic play.)

________ Outstanding
________ Above average
________ Average
________ Below average

4. *Vocabulary Development* (Uses a reasonably large and appropriate vocabulary.)

________ Outstanding
________ Above average
________ Average
________ Below average

5. *Language Arts* (Expresses written ideas effectively. Expresses oral ideas effectively.)

________ Outstanding
________ Above average
________ Average
________ Below average

6. *Handwriting* (Writes rapidly, neatly, legibly.)

________ Outstanding
________ Above average
________ Average
________ Below average

7. *Reading* (Reads with understanding. Applies phonetic understandings. Uses skills in word structure. Reads well orally. Likes to read.)

________ Outstanding
________ Above average
________ Average
________ Below average

8. *Spelling* (Spells correctly in all written work.)

________ Outstanding
________ Above average
________ Average
________ Below average

9. *Arithmetic* (Understands meanings of numbers taught. Understands processes in arithmetic work. Works accurately. Applies arithmetic to everyday problems.)

________ Outstanding
________ Above average
________ Average
________ Below average

10. *Intellectual Curiosity* (Asks many questions. Has wide range of interests. Discusses new ideas eagerly. Observes unusual things.)

________ Outstanding
________ Above average
________ Average
________ Below average

11. *Pride in Accomplishments* (Is satisfied with only high-quality work. Enjoys doing well in most school work.)

________ Outstanding
________ Above average
________ Average
________ Below average

12. *Persistence* (Plans and carries through work consistently. Continues with difficult tasks.)

________ Outstanding
________ Above average
________ Average
________ Below average

13. *Emotional Development*

________ Normal
________ Unusual

If checked unusual, describe: ______________________________
____
____
____

14. *Social Development*

________ Normal
________ Unusual

If checked unusual, describe: ______________________________
____
____
____

15. *Physical Coordination*

________ Normal
________ Unusual

If checked unusual, describe: ______________________________
____
____
____

16. *This Child Is Accomplishing the Regular Second-Grade Work*

________ With ease
________ With considerable individual help from the teacher
________ With difficulty

17. *This Child Could Now Do Regular Beginning Third-Grade Work*

________ With ease
________ With a little further study and work
________ With considerable individual help from a third-grade teacher
________ With difficulty

18. *This Child Could Now Do Regular Beginning Fourth-Grade Work*

________ With ease
________ With a little further study and work
________ With considerable individual help from a fourth-grade teacher
________ With difficulty

thought might profit by acceleration and rate them, using the same form. Subsequently, all children identified by the IQ testing and by teacher nomination were given a standardized educational achievement battery.

On the basis of the three types of information—IQ, teacher rating, and achievement tests—a sample of sixty children was identified. This group was then divided randomly, half to receive five weeks of instruction during the summer and be promoted subsequently to the fourth grade, with the other half proceeding as usual into the third grade. If the results reveal the acceleration to be profitable from second to fourth grade, the pupils continuing normally through the third grade will attend a summer session at the end of the third grade and then be placed in the fifth grade. (No child above median chronological age, if accelerated, will finish high school before the age of seventeen years and one month; if not accelerated, eighteen years and one month.)

The purpose of the rating scale was to get information from teachers, based upon their observation of the pupils during the first seven months of the second grade. For this reason it is comprehensive and does not define each area being rated in great detail. For the particular purpose, however, the administrative, curriculum, psychological, and teaching staffs of the school, as well as the experimenters, felt that it would provide useful information on which to base decisions.

Creativity is an objective of education for all children, but particularly for those of above-average learning abilities. In a longitudinal research project in the Milwaukee Public Schools, some experimental tests of creativity were devised and administered to tenth- and eleventh-grade students of superior learning abilities. Did the tests measure creativity? To obtain a partial answer the experimenters turned to teacher observations and ratings.

A problem was arranged to elicit student responses during one class period. For example, in social studies the students wrote an essay on the topic, "One state, one nation, one world." With no previous practice or coaching, the students appeared at a regular class meeting and received the following instruction in order to elicit the essays:

> As part of a study in creative thinking, I (the teacher) am working with the University of Wisconsin. We have agreed to provide the University with samples of creative work, so we have arranged the following exercise for you today instead of your regular assignment. This is an exercise in creative thinking. It will not count for your grade, and there are no right or wrong answers. How clearly you write, how you organize your ideas, and how neatly you write are not important. Write as many ideas as you can about the topic now presented. Remember, give as many original, sound, and clever ideas as you can think of. I cannot answer any questions you might have during the rest of the period.

The following chart gives the rating scale of creative expression used

RATING SCALE OF CREATIVE EXPRESSION

	5	4	3	2	1
Number of ideas					
Originality of ideas					
Quality of ideas					

for evaluating what each student produced. The number of ideas each student expressed was counted. After a distribution was made of this count, the students in the upper 20 percent were assigned a rating of 5, the next 20 percent a rating of 4, and so on, with the bottom 20 percent assigned a rating of 1. Originality was defined as new, different, and clever ideas not normally expressed by other students of this age, with a 5 being considered high and 1 low. Quality of ideas was rated in terms of what the rater considered to be quality in the particular subject field. Each of the three characteristics rated was given equal weight in arriving at a total score; for example, if a paper was rated 5 in number of ideas, 2 in originality, and 4 in quality of ideas, the total rating was 11.

The classroom teacher, the curriculum coordinator in the particular subject field, and a member of the university staff rated each paper. The average of the three ratings was used as the score of creative expression. This procedure whereby three competent persons rate the same performance improves the accuracy of the ratings. There is no better way for a teacher to check the reliability of his ratings of pupils' performances than to have another equally competent teacher rate the same performance and then compare the two sets of ratings.

These general guides may be useful in constructing rating scales:

1. Select qualities and performances for rating in relation to objectives. Generally, it is unwise to rate students on a quality or performance which you do not attempt to develop in class.

2. Use rating scales for important objectives which cannot be appraised by other means. It is better to rate performance related to one or two objectives, and to do it well, than to organize many scales which result in snap judgments.

3. Carefully describe each rating in terms of your ability to discriminate performance and behavior related to it. It is better to use only three ratings —excellent, average, poor—which you can discriminate than to further subdivide into five, eight, or ten ratings which you have difficulty in discriminating.

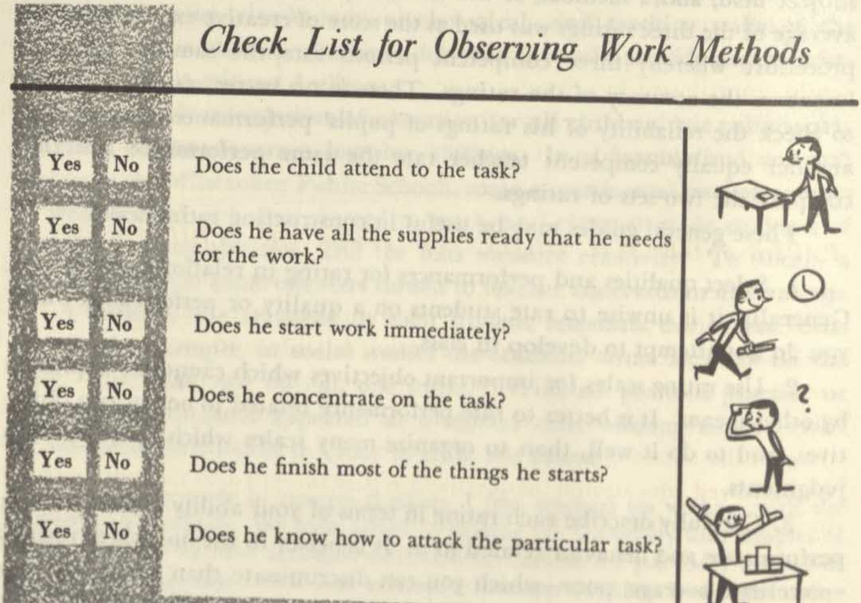
4. Compare your ratings of an individual's performance with the rating of another teacher who understands the scale and performs the rating at the same time.

5. Make your scales understandable to students so that they aspire to achieve higher performance and so that they may rate themselves. Along with the usual areas of achievement and conduct, self-rating scales facilitate learning and self-evaluation by the students.

Check List

The check list used in the "count down" before firing a space missile is one of the most complex check lists ever devised by man. It serves the purpose of checking things off according to a fixed schedule which must be followed if the firing is to be successful. In the assembly of complex machinery such as an electronic computer, a detailed check list is also used. The teacher does not devise such elaborate instruments; however, whether the student is sewing a formal dress or conducting an experiment, the teacher often has developed a check list, either mentally or explicitly in written form. While observing the students' performances, he checks the sequence and accuracy of the students' activities. This check list, of course, may become a rating scale if each step is rated on two or more bases such as right–wrong or appropriate–inappropriate.

Figure 16.3 presents a check list for observing work methods of students. It is generalized rather than highly specific, but has been found useful by many teachers to guide their observation of students' work methods. Notice that the only checks are "Yes" and "No." The checking in itself does not help the student or the teacher. A check of "No" should be interpreted to mean that the student has not yet acquired one of the behaviors and needs help to improve his performance.



Check List for Observing Work Methods

Yes	No	Does the child attend to the task?
Yes	No	Does he have all the supplies ready that he needs for the work?
Yes	No	Does he start work immediately?
Yes	No	Does he concentrate on the task?
Yes	No	Does he finish most of the things he starts?
Yes	No	Does he know how to attack the particular task?

FIGURE 16.3.

Anecdotal Records

Behavior varies to some extent with the situation. The child who shows a great deal of interest and gets to work immediately with enthusiasm in the classroom may show no interest and accomplish little on the playground. Objective records of behavior in different situations give important clues to understanding the child and identifying the characteristics which make him unique. The following procedures are helpful in making anecdotal records of behavior: (1) Briefly, but in enough detail to reveal important aspects, describe the situation in which the behavior occurs. (2) Record the pupil's behavior exactly as it occurs; include specific details. (3) Check what has been recorded to make sure that it contains no subjective elements—adjectives such as "good" or "bad," "bright" or "dull," "lazy" or "industrious." (4) Interpret the behavior if there is enough information to reveal a pattern. Indicate clearly that it is your interpretation, and keep it separate from the objective portion of the record.

Studying a child in different situations enables one to learn much about child behavior in general and to gain insight into the various methods for best coping with the characteristics of children. Anecdotal records for one child, contributed by the several teachers who have the child in class, are especially valuable for gaining better understanding of a child whom teachers do not understand well or who is not making good progress.

PAPER-AND-PENCIL OBJECTIVE TESTS OF ACHIEVEMENT

In the intermediate grades, high school, and college, the majority of tests used are of the paper-and-pencil type, comprised of objective items. Well-constructed teacher-made tests are as valid, reliable, and useable as standardized tests. In many instances the teacher-made test has higher content validity than the standardized educational achievement test. The teacher designs the test to measure the objectives of a particular class, whereas the standardized educational achievement test is intended to measure outcomes in a large number of school situations. To facilitate understanding of and to improve skill in writing various types of items, consider the more complete discussion of: (1) types of objective test items; (2) types of outcomes measured; (3) tests of work samples; (4) guides for constructing objective tests.

Types of Objective Test Items

The principal types of objective test items are alternate-choice, multiple-choice and multiple-response, matching, and completion. There are many variations of each type.

ALTERNATE-CHOICE. An alternate-choice item requires the student to choose one of two answers as being more nearly correct.

Two Option:

The revised Stanford-Binet Scale is administered (1) individually, (2) to groups.

The Kuder Preference Record measures (1) interest, (2) aptitude.

True–False:

Evaluation is more comprehensive than measurement.

Discovering the relative position of students in the class is a primary purpose of evaluation.

Yes–No:

Are all tests reported in *The Fifth Mental Measurements Yearbook* standardized?

Do both the Revised Stanford-Binet Scale and the Wechsler Intelligence Scale for Children yield a total IQ?

Right–Wrong:

A primary purpose of evaluation is to help students progress on learning tasks.

The Strong Interest Blank for Men is a self-report inventory.

Agree–Disagree:

The Rorschach Ink Blot Test is widely used by teachers.

The Iowa Test of Basic Skills is a standardized educational achievement test.

Same–Different:

Ratio IQ–Deviation IQ

General Intellectual Ability–Scholastic Aptitude

Examine these true–false items to discover poor construction:

Standardized tests scarcely ever have reliability coefficients of 1.00.

Essay tests should not be used infrequently in any course.

Aptitude and ability are synonymous.

The title of Chapter 8 of this book is: "Psychomotor Skills and Abilities."

You probably agree that "scarcely ever" is vague; "not infrequently" makes the second item difficult, if not impossible, to answer; "aptitude" and "ability" usually have different meanings but may not always, depending on the context in which they are used; and the last item demands recall of specific words from the text—also, it could readily be a "trick" question because it is correct except that "Skills" and "Abilities" are reversed.

Some strengths of alternate-choice tests are that they may be adapted to testing in many classes, a great deal of material may be tested in a short time, and they are easily scored. In testing achievement, the weakness of alternate-choice tests is apparent: guessing is encouraged, the learner is presented with a wrong as well as a right response, and it is extremely difficult to construct alternate-choice items in which either choice is always correct or always incorrect. When part of the items in the test are usually true and others are always true, the student is faced with the problem of deciding whether a usually true item should be marked "true" or "false."

MULTIPLE-CHOICE AND MULTIPLE-RESPONSE. The sample items from a standardized educational achievement battery presented in Chapter 15 (p. 468) are multiple-choice items in which the student selects one of three, four, or five choices as correct or better than the others. The multiple-choice item is used widely in standardized educational achievement tests because it is adaptable to measuring such outcomes as facts, understanding of concepts, the ability to apply information, and the ability to evaluate, as will be shown in a later discussion of outcomes measured by paper-and-pencil tests.

Multiple-response items require the student to choose all the correct choices in a series. Now follow examples of multiple-choice and multiple-response items:

Multiple-choice:

To ascertain the effects on students' attitudes of a unit on food selection, the best evaluation procedure is to

A. use a teacher-made objective test over the unit.
B. use an essay test over the unit.
C. have the students plan menus for a hypothetical family for the week.
D. observe the students' food choices at lunch in the school cafeteria.

Multiple-response:

Which of the following are educational achievement batteries?

A. Iowa Tests of Basic Skills.
B. Differential Aptitude Tests.
C. California Test of Mental Maturity.
D. Sequential Tests of Educational Progress.
E. WISC.

Multiple-choice items are more difficult to construct than are alternate-choice. Here are some general suggestions that may be used as a check list in making multiple-choice tests:

1. Select for each test item a concept or generalization of significance.
2. State the introductory statement and the choices clearly and concisely.
3. Avoid use of identical words in the introductory statement and the correct choice.
4. Include at least four choices to minimize guessing.
5. Make the choices parallel in English construction, i.e., start all choices with a verb, a noun, or a preposition, etc.
6. Make only one choice correct; in part this is accomplished through careful wording of the introductory statement.
7. Make all choices plausible. Choices readily recognized as incorrect are useless for testing purposes.
8. Make the choices of equal length. When the correct choice is longer or shorter than the incorrect choices are, the student may select it for that reason.
9. Distribute the correct choices equally in the total test; that is, have equal numbers of A, B, C, and D choices as the correct ones.

10. Set up clear instructions for the students to follow and arrange for quick scoring of the test.
11. In an untimed test have easy items first with items going in the direction of increasing difficulty. In a timed test, include difficult items early in smaller groups of easy-to-hard items.

MATCHING. Sets of matching items call for pairing an item in the first column with a word or phrase in the second column. There are many kinds of learnings which involve association of two things. Generally, matching items measure only whether the association has been made and whether the student recognizes it; matching items do not usually measure the extent to which meaning has been established. Matching items may have no distracters or several; now follow a set of matching items with no distracter and a set with one distracter.

Matching items with no distracter:

(Match each item with the proper entry, A–D, based on material in Chapter 10.)

1. Denying the existence of some troublesome drive.
2. Taking pride in the success of someone else.
3. Accusing others of sins which tempt us.
4. Finding excuses for our behavior which we know is improper.

A. Rationalization.
B. Identification.
C. Repression.
D. Projection.

Matching items with a distracter:

(Match each item with the proper entry, A–E, based on 1937 Revision of Stanford-Binet Scale.)

1. Includes about 45% of the population.
2. Includes about 2% of the population.
3. Includes about 14% of the population.
4. Can learn to read at a low level.

A. IQ 70 and lower.
B. IQ 115–130.
C. IQ 90–110.
D. IQ 45–65.
E. IQ 25–45.

In constructing matching items it is well to use related materials within groups of items to be matched. For example, if you wish to test association of synonyms and association of men and events, use two sets of items—the first dealing with synonyms and the second with men and events. Also, do not provide clues to the answers. Notice in the example with no distracter that each item begins with a participle and the things to be matched are all nouns.

Including a distracter eliminates some possibility of guessing. For example, in the example with no distracter if the student knows two of the answers, he then has a fifty-fifty chance of guessing the other two correctly. Further, he may give the same answer for both unknowns, thus assuring himself that one is correct.

Sets of matching items should take into account the developmental level of the learners and the difficulty of the items. Long sets of items with several distracters are difficult; more important, when many errors are made by the students the test has little diagnostic value.

COMPLETION. Completion tests are those in which words or phrases have been omitted in sentences; the student is to fill in the omitted word or phrases. This kind of test may measure ability to recall or to perceive relationships. Here is a sample of each:

Standardized tests usually have higher ________, ________, and________ than do essay tests.

An achievement test administered near the end of the twelfth grade is a good ________ test for college entrance.

Following are examples of poorly constructed completion items:

A ________ test score is meaningless until converted into a derived score.

The ________ Test measures intelligence.

________ tests may be grouped into categories: ________

You probably agree that in the first poorly constructed item, the use of the article "A" gives a clue to the answer; the second is vague and indefinite and any one of several answers is correct; and the third has so many missing words that it is impossible to tell what is wanted.

To facilitate scoring of completion tests, consecutive numbers may be placed in the blanks, with instructions that the answers corresponding to the numbers be placed in the left margin.

Types of Outcomes Measured

Progress is being made in devising paper-and-pencil tests which measure more than memory or understanding of facts and concepts. The student's ability to apply factual information, to analyze it, to come up with the proper conclusion, and to evaluate may be appraised with skillfully constructed tests.

Whether a test simply measures memory of factual information or measures application of facts depends in part upon what the student already knows. For example, in the previous matching items based on Stanford-Binet IQ's, if a person knows that the mean IQ is 100 with a standard deviation of 16 and knows the area under various portions of the normal probability curve, he can get all the items right by applying this information. In this case the matching items measure application. However, if the student does not know the above information but must rely upon his recall of a table or chart, the items measure recall of factual information.

With this in mind we turn now to sample items intended to measure the ability to apply information, the ability to analyze information, and the ability to evaluate information. These examples and the related discussion are drawn from Bloom (1956), who in turn selected the items from Brownell (1946):

APPLICATION:

The underlined statement at the end of the problem is assumed to be a correct answer. You are to explain the underlined conclusion by selecting statements from the list following the problem. (The student checks the explanations.)

If a person is planning to bathe in the sun, at what time of day is he most likely to receive a severe sunburn? *He is most likely to receive a severe sunburn in the middle of the day (11 A.M. to 1 P.M.) because:*

________We are slightly closer to the sun at noon than in the morning or afternoon.

________The noon sun will produce more "burn" than the morning or afternoon sun.

________When the sun's rays fall directly (straight down) on a surface, more energy is received by that surface than when the rays fall obliquely on the surface.

________When the sun's rays fall directly (straight down) on a surface, less sunshine is reflected from the surface than when the sun's rays fall obliquely on that surface.

________When the sun is directly overhead the sun's rays pass through less absorbing atmosphere than when the sun is lower in the sky.

________Just as a bullet shot straight into a block of wood penetrates farther into the wood, so will the direct rays at noon penetrate more deeply into the skin.

________The air is usually warmer at noon than at other times of the day.

________The ultraviolet of the sunlight is mainly responsible for sunburn [Brownell, 1946, p. 114].

"It is assumed that this is a new problem for the student and that the task is one of selecting the correct explanatory principle. Some of the alternatives offered are factually correct while others are incorrect. Some are relevant, others are irrelevant. Some merely repeat the conclusion, while others state the generalizations or principles which have explanatory value. Selecting the appropriate explanatory generalizations requires that the student be able to relate the appropriate generalizations to the situation" (Bloom, 1956, p. 53).

ANALYSIS:

Statement of facts. The following table represents the relationship between the yearly income of certain families and the medical attention they receive.

Family Income	Percent of Family Members Who Received No Medical Attention During the Year
Under $1200	47
$1200 to $3000	40
$3000 to $5000	33
$5000 to $10,000	24
Over $10,000	14

Conclusion: Members of families with small incomes are healthier than members of families with large incomes.

Assumption: (Select one)

(1) Wealthy families had more money to spend for medical care.
(2) All members of families who needed medical attention received it.
(3) Many members of families with low incomes were not able to pay their doctor bills.
(4) Members of families with low incomes did not receive medical attention [Brownell, p. 127].

"If it is assumed that the data and the problem are essentially new to the student, it requires that the student be able to identify the assumption which must be made to support the conclusion in relation to the data" (Bloom, p. 53).

Evaluation:

A 6A class was studying the geography of Europe and the land of the Dutch· people. Someone in the class said that the homes of the Dutch people who live in America are always neat and clean. The teacher asked this question, "What reasons can you give for thinking that they are always neat and clean?"

Here are some of the reasons the children gave. Read them carefully and decide which are the best and which are the poorest.

________I heard someone say that they were neat and clean.
________I was in one Dutch home and it was clean.
________Our geography book said they were clean.
________I have been in many Dutch homes and all of them were neat and clean.
________I read in the story book that these houses were always neat and clean [Brownell, p. 93].

"Here the student is expected to judge the value of reasons in relation to a new question which is posed in the problem" (Bloom, p. 54).

Many teachers are using such measurements of learning outcomes in daily instruction rather than putting them in written tests. Also, test makers are increasingly trying to measure abilities by means like those described above. The *Sequential Tests of Educational Progress,* discussed in Chapter 15, intend to measure more of these outcomes of education and less recall of factual information.

Tests of Work Samples

In many classes work samples rather than paper-and-pencil tests are used by the teacher in evaluation. A few of the areas in which work samples are used will be discussed.

In business education the main tests are samples of typing, shorthand, and bookkeeping. The student simply hands in his work according to instructions of the teacher; this constitutes the test. In mathematics, students are assigned work to be performed; they turn it in and the teacher scores or otherwise marks it. In social studies, an outline map is given to the student on which he places names of countries, cities, rivers, products, and the like. If there are thirty entries the teacher may simply count each correct entry to arrive at a total score. In the natural sciences a variety of work samples is handled in the same manner. The work sample yields as useful evaluative information as any of the tests already discussed. When used for testing purposes, the work sample can be arranged to measure a variety of educational outcomes and may be scored objectively.

Guides for Constructing Objective Tests

Ross and Stanley (1954) give a meaningful group of guides for constructing classroom tests of achievement, most of them self-explanatory in terms of the previous discussion in this chapter and in Chapter 15:

A. Planning the Test

1. Adequate provision should be made for evaluating all the important outcomes of instruction.
2. The test should reflect the approximate proportion of emphasis in the course.
3. The nature of the test must take into consideration the purpose it is to serve.
4. The nature of the test must take into consideration the conditions under which it is to be administered.

B. Preparing the Test

1. The preliminary draft of the test should be prepared as early as possible.
2. The test may include more than one type of item.
3. Most of the items in the final test should be of approximately 50 per cent difficulty. . . .
4. It is usually desirable to include more items in the preliminary draft of the test than will be needed in the final form.
5. After some time has elapsed, the test should be subjected to a critical revision.
6. The items should be so phrased that the content, rather than the form of the statement, will determine the answer.
7. The items should be so worded that the whole content functions in determining the answer, rather than only a part of it.
8. All the items of a particular type should be placed together in the test.
9. The items in the test should be arranged in ascending order of difficulty.
10. A regular sequence in the pattern of responses should be avoided.
11. Provision should be made for a convenient written record of the pupil's responses.
12. The directions to the pupil should be as clear, complete, and concise as possible.

C. Trying Out the Test

1. Every reasonable precaution should be taken to insure normal conditions for the test.
2. The time allowance for the test should be generous.
3. The scoring procedure adopted should be fairly simple.
4. Before the actual scoring begins, answer keys and scoring rules should be prepared.

D. Evaluating the Test

1. The difficulty of the test is a rough indication of its adequacy.
2. The internal consistency of the individual items in the test is determined by their ability to discriminate between pupils who rank high and those who rank low on the test as a whole.
3. It is a good practice to have the items interpreted or criticized by persons who have taken the test.
4. Whenever possible, the results on the test should be checked against an outside criterion.
5. It is sometimes desirable to obtain the reliability coefficient of the test [Ross and Stanley, 1954, pp. 139–162].[1]

Three of the guides warrant further discussion. Number 3 under "Preparing the Test" implies that the average score made by all students who take the test should be about 50 percent. This is desirable if the intent is to devise a test which spreads the scores from very low to very high. In many cases, however, the teacher wants to find out how well the students have learned what has been taught, for example, twenty spelling words during the week. In this case, the test is comprised of the twenty words, and if every pupil scores 100 percent the teacher is satisfied with the test. If the average score is 50 percent, the teacher is properly dissatisfied with her teaching methods or with the performances of the pupils.

The same idea applies to Number 1 under "Evaluating the Test." A test, of course, has a low reliability coefficient when students get most of the items correct. This in itself, however, is not adequate cause for selecting items that have not been taught or which the teacher thinks many students cannot for any other reason answer correctly.

Guide 5 under "Evaluating the Test" indicates the desirability of obtaining a reliability coefficient. Stanley has outlined excellent procedures for doing this (Ross and Stanley, pp. 436–453). Without computing a reliability coefficient, one can get a rough estimate of reliability by the following procedure. First, construct the best test possible and administer it. Second, score first the odd-numbered items and then the even-numbered items. Third, record the score on the odd-numbered items and then on the even-numbered items for each individual. Now, if the two scores for each individual are exactly the same, your test is 100 percent reliable. Suppose it is a 100-item test and many individuals have differences in scores of four or more on the two parts. Your test is not highly reliable. Suppose a student made a score of 38 on the fifty odd-numbered items and a score of 33 on the fifty even-numbered items. The percentage correct for each part test is 76 and 66 respectively. Suppose 70 percent is a passing mark. Which of the two scores should be used to decide whether the student passed? Your marking system should not have finer limits than the reliability limits of the tests used in arriving at the scores.

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[1] C. C. Ross and J. C. Stanley, *Measurement in Today's Schools*, 3rd ed. © 1954. Prentice-Hall, Inc., Englewood Cliffs, N.J. Reprinted by permission of the publisher.

ESSAY TESTS

An essay test item may be responded to in a few minutes, during a class period, or during a longer period of time. If responded to in a few minutes, it is designated "short-answer"; if during a class period, an "essay test"; and if during more than a regular class period, an "essay examination." These are arbitrary designations, of course, and are not equally applicable to third-grade children and high school seniors.

Whether shorter or longer items are included, essay tests may be used to appraise the student's ability to express himself clearly in written form, his ability to recall and organize relatively large amounts of material, and his ability to evaluate critically. If all three purposes are to be achieved with one test item, scoring must take all three factors into account. For example, the item "Evaluate the strengths and weaknesses of standardized tests" might be scored on the basis of how clearly the student expressed himself in written form, how many facts he cited, and how adequate his evaluation was. If only one mark were to be given for the entire answer, the teacher would have to decide how much weight to give each factor; this is difficult to do. It is perhaps wise to provide separate items for each factor, but this often destroys the usefulness of the test. In other words, a test with many short-answer items would make possible more reliable scoring but would not measure part of what it was intended to measure.

Clarity of Expression

Ability to express oneself clearly in written form is important in classes in creative writing, English composition, journalism, and business English. A teacher might use an essay test in summary evaluation or in preliminary appraisal of this ability. Appropriate items might be:

Outline the plot of *As You Like It.*
Write a theme on . . . .
Discuss the importance of form in business letters.
Summarize the important principles in writing a news story.

Recall and Organization

An essay test may be constructed to measure the student's ability to recall a relatively large amount of material and to organize it into a meaningful pattern. This ability may be important in social studies, science, and literature. Here are samples of recall questions, frequently called essay questions:

What are the provisions of the Eighteenth Amendment?
What nations are members of the United Nations?
List the Presidents of the United States since 1860.

Marking these items is fairly simple, but they do not measure ability to organize facts except at a very low level.

Items that appraise organizational ability must be more general. They might follow this pattern:

How did our tariff policies change from 1920 to 1940?
Discuss the growth of organized labor since 1880.
Describe how a federal revenue bill is enacted into law.

These questions require recall, longer answers, and more organization than the items in the first group, and they are more difficult to mark objectively.

Critical Evaluation

In many courses the teacher wants to develop the students' ability to evaluate critically. To some extent this ability may be measured by means of essay tests. Items intended for this purpose frequently begin with "How," "Why," "Compare," "Contrast," or some other term implying critical evaluation:

Why were the Articles of Confederation unsatisfactory? (A copy of the Articles may be provided.)
Compare the tariff policies of the Republican and Democratic parties, 1880–1948.
Contrast the editorial policy of the Chicago *Tribune* and of the New York *Times*. (The editorials may be supplied.)
Why does organized labor oppose the Taft-Hartley Act?

The emphasis in these questions is upon relationships, on the application of facts to broader problems, and on the evaluation of the facts and relationships.

In addition to the advantages already discussed, essay tests may also enable the student to acquire better methods of studying in preparing for an essay test than for an objective test. English teachers and teachers of other courses also use essay tests to encourage writing abilities and to gain insight into other cognitive abilities of children.

However, essay tests have certain weaknesses. Their validity may be low if they do not cover a comprehensive area of the subject field. There appears to be no way to correct for quality of handwriting and use of English, although these factors affect the tester's estimate of what is being measured. Essay tests may show low reliability, partly because only a few items may be answered during the test period and also because subjectivity enters into the scoring. Greater validity and reliability can be obtained when the teacher constructs test items carefully, defines the criteria for scoring the tests, and compares the marks given with those given by another competent teacher. Essay tests are more time-consuming to mark than objective tests.

SELF-REPORTING DEVICES

In Chapter 15 a number of published self-report inventories and check lists are described. Among other things, such instruments attempt to elicit information whereby interests, attitudes, values, problems, and a variety of personality traits of the student may be directly ascertained or inferred. The results of self-reports are best used to help the student understand himself, to help him make decisions about personal and educational matters, and to assist the teacher, psychologist, or other school persons to provide optimal educational opportunities for him. The same purposes hold for teacher-made devices, including (1) questionnaire and check list as self-reports; (2) diary and autobiography; (3) conference and interview; (4) sociometric tests.

Questionnaire and Check List

The questionnaire and check list may be adapted to obtaining many kinds of information and may be planned to elicit general or specific responses. Here are questions intended to secure general responses:

1. Do you feel well and physically fit?
2. What do you like most about your home life?
3. What are your favorite recreational activities?
4. How do you get along with your classmates?
5. What are your plans after graduation?
6. What kinds of work do you think you are best suited for?
7. Are you getting from school what you need most?

Each of these questions may be made more specific and incorporate a checking feature. In this case interpreting the answers is less difficult, but considerably more time is needed to construct the questionnaire; also, the student's response is guided, not completely voluntary. Thus, the first question "Do you feel well and physically fit?" may be subdivided to include specifics, only one of which the student is to check:

a. All the time; never feel tired or ill.
b. Most of the time; feel tired once or twice each month.
c. Feel tired or unwell several times each month.
d. Feel tired or ill as many days as feel well.
e. Feel ill or tired most of the time.
f. Have not felt well for the past few months.

The student checks one of these choices but gives no reason for doing so. If the student's attitude toward his health as a whole is desired, it is better to use the general question without the specific choices.

Diary and Autobiography

The diary and autobiography, to be useful to the teacher in understanding the student, must be personal for the student. Since this is the case, the student should not be required to keep or to provide either one to the teacher unless it is understood that the purposes are as set forth previously for self-reporting devices. As a teacher the author has not invited any elementary, high school, or college student in his classes to keep or to present to him a personal diary and does not plan to do so. Below is an outline for an educational autobiography which he uses in a first course in educational psychology.

EDUCATIONAL AUTOBIOGRAPHY

I. Review your formal and informal educational experiences up to this semester which you consider significant as a background for a teaching career. School, home, community, and church experiences may be included. You may wish to describe certain episodes or situations in detail. Other long periods of time may be dealt with in a sentence.

II. Give three to five of your main strengths for teaching, showing how they are related to the experiences above.

III. Discuss any doubts you may have about your qualifications for teaching or about teaching as a profession, showing how they are related to the experiences above.

IV. Indicate what you will be doing five years after graduation and how well you will be satisfied with yourself and life generally at that time.

The student knows from the outset that the main purpose is to promote self-understanding and that no part of the autobiography will be revealed to any one else except with his consent (occasionally part of an autobiography is mimeographed without the student's name to illustrate style of writing, organization, type of significant incident, and the like). No information presented in the autobiography is communicated to any other person, including any one responsible for such decisions as encouraging the student to abandon a teacher-education program or to place him in a teaching position after he is graduated.

The autobiography is returned to the student at the time of the final interview between the student and instructor. Handled in this manner, the autobiography is useful in helping the student to understand himself better, to think about his lifetime goals, and to consider seriously the prospects for achieving his life goals through a career in teaching. Also, the student learns from first-hand experience some of the problems that may be encountered subsequently if he as a teacher invites pupils to reveal themselves accurately in an autobiography.

Conference and Interview

Conferences and interviews may be conducted like a prosecuting attorney examining a hostile witness or in an emotionally secure manner. The conference may be used to secure factual information of a nonemotional type, to discuss the results of a test or other evaluation procedure, to ascertain the causes of conflict between or among students, to appraise a student's personal problems, and the like. Though the conference must be planned for and conducted in terms of its purpose, the following guides are appropriate to many types:

1. Get to the purpose of the conference quickly, particularly if you initiated it.

2. Be courteous and friendly, regardless of the student's emotional state. For example, if the student is angry because he received a much lower grade than he expected, be calm and friendly as you ask him to tell you how he feels about the situation and what he thinks should be done about it.

3. Reflect the student's feelings in your comments and questions until the student gets his grievance "off his chest." Ask questions of the withdrawing or defensive student to keep him talking about his problem, but do not cross-examine. Unless severely upset, the student will give you all the information you need without much questioning if he trusts you.

4. Accept what the student says without contradicting him. If emotional, he will not accept contradiction from another person. If he is allowed to express his feelings, he himself will recognize when what he says is not factual.

5. Use words which the student understands, for a conference is basically a learning situation for him.

6. Reassure the student whose main problem is lack of assurance. A pat on the back and praise for what he has done well is all that is needed in some cases. But do not deceive a student by telling him that everything is all right when it is not.

7. Provide the student with the necessary information about any area in which he is in the process of making a decision—choice of courses, cocurricular activities, friends, dating, and the like. Give him only enough information, however, to get him started securing information for himself if he can readily do so. In many places throughout his school life, the student needs information that is based upon adult experiences and he cannot readily get it except from adults. This is especially true in all situations involving conflicting values.

8. During the conference, summarize what has happened; do this yourself or ask the student to do it. For example, asking an emotionally upset student to summarize what has been said may help him to think more rationally about his problem. In discussing career choices, such a summary aids the student in clarifying his choice.

9. Encourage the student to propose a plan of action or to give a reasonable explanation of his problem. You may need to make suggestions to the student who apparently cannot bring himself to do this. You may find that such a student is severely disturbed emotionally or is faced with unfavorable conditions at home or in school which he cannot control.

10. Close the conference by summarizing what has happened, having

the student do this, stating what apparently has been agreed upon concerning plans or arranging for another conference.

After the conference, a written note might be made for the student's folder. If action by you is required, start it as soon as possible. For example, if some condition in the student's home or school life should be changed, initiate such changes yourself or go to the person who can. If the student is so severely disturbed that you cannot help him, begin referral procedures. After a series of conferences, further observation of the student is required for noting of any improvement; this follow-up helps in deciding whether future conferences may be helpful.

Most teachers, whether they want to or not, must confer with students at some time. It is rare to find a student who can solve his problems without individual guidance from adults. The student's success or failure in solving his problems and the help he receives from teachers and other adults are important in determining his success or failure as an adult. A little time spent with a student in individual conference may save years of therapy later in his life or even years in a penal institution. Further, some students will provide information more reliably in a conference than in written form. Also, the teacher and student can make certain that the information desired and given is understood.

Sociometric Tests

Many teachers use a sociometric test for seating students in a classroom, for organizing students in work groups both in and outside the classroom, and for establishing effective relationships with the group soon after meeting them. Analysis of the results reveal to the teacher the interaction of the group as a whole, the patterns of friendship, and the kind and intensity of interaction among specific individuals within the group. The popular members of the group, the isolated and rejected members, and the cliques can be identified. When the teacher knows who the most popular members of the class are—there are usually from three to six in classes with twenty-five to thirty-five students—gaining their cooperation will assure him that most of the rest of the class will follow. When the isolated and rejected are located, the teacher knows who needs help first in making a good adjustment to the classroom.

ADMINISTRATION OF THE TEST. Depending on the purpose of the test and type of information desired, each student is asked to give the names of his best friends in the class, the students he would like to sit next to, those he would like to work with on a class project, or those he would like to work with in out-of-class activities. If the class is large, it is probably wise to ask each student to list three to five names. There is some advantage in placing no limit on the number of choices, for this will reveal more concerning the whole group.

The teacher makes sure that the students' choices are not revealed to other students, that they have no opportunity to discuss their choices before listing them, and that they do not see the pattern presented by their choices. The following are sample directions, using seating arrangement as the basis of choice:

> You are now seated according to an alphabetical arrangement. Some of you have told me that you would like to change your seats. I want to give all of you an equal chance to sit near your friends. To help me do this, please write the names of those whom you would prefer sitting next to. Give your first, second, third, fourth, and fifth choices. I will use your choices to rearrange your seats. No one else will see your list of names.

To facilitate this, and especially to eliminate questions which would provide an opportunity for the discussion and comparison of choices, the teacher may give each student a slip of paper or 3 × 5 card like the following:

My name ____________________
Students I would like to sit next to:
First choice ____________________
Second choice ____________________
Third choice ____________________
Fourth choice ____________________
Fifth choice ____________________

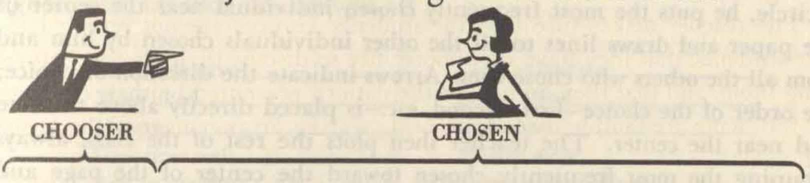
It is imperative that the directions be specific and easily understood, that they be presented informally in a classroom situation, that they include the reason for administering the test, and that the data obtained lead to action by the teacher.

TABULATING AND DIAGRAMING. After the students have listed their choices, the teacher records them as shown in Figure 16.4. In the left margin are the names of the choosers. These same names are written across the top of the page in the same order under "Chosen." Choices made by each student are placed in the proper column under "Chosen." The number of choices received by each individual is obtained by totaling each vertical column. At the bottom of the chart are entered the total number of first, second, third, fourth, and fifth choices each student received.

A score for each individual may be arrived at by multiplying the total number of first choices by 5, the total number of second choices by 4, and so on down to 1 for fifth choice. Thus, a student receiving three first choices, two seconds, and four thirds has a score of 35: 15 + 8 + 12.

To seat the students according to their choices and to secure an overview of the patterning in the class, the choices are diagramed as shown in

Form for Tabulating Sociometric Data



	Alben	Anice	Briggs	Bush	Fabian	Fried	Gida	Gillet	Harms	Kay	Lee	Lester	Patmore	Prince	Ray	Ritter	Rusk	Smith	Stark	Towns
Alben	•			2			1				3				5				4	
Anice	5	•			2		4					1					3			
Briggs		4	•			1							3			5				2
Bush	1		5	•			2			4									3	
Fabian		3		2	•						5				4				1	
Fried			3			•	1			2							4			5
Gida	1	2		3		4	•			5										
Gillet							1	•							2					
Harms			1				3		•										2	
Kay		5		4						•			3				2			1
Lee	4				2						•				1					3
Lester		1										•								
Patmore			2							1			•							
Prince														•						
Ray	4				2		3				1				•		5			
Ritter			1						2							•				
Rusk		1				3											•			2
Smith					4		2					3			1	5		•		
Stark	2				5		1				3								•	4
Towns		4					3			1				5		2				•
1st choice	2	2	2			1	4			2	1	1			2				1	1
2nd choice	1	1	1	2	3		2		1	1					1	1	1		1	2
3rd choice		1	1	1		1	3				2	1	2				1		1	1
4th choice	2	2		1	1	1	1			1					1		1		1	1
5th choice	1	1	1		1					1	1			1	1	2		1		1
Score	19	22	18	13	15	10	39	0	4	17	12	8	6	1	17	6	9	1	14	19

FIGURE 16.4. *(Adapted from Klausmeier, 1958, p. 53.)*

Figure 5.7 (p. 146). In a diagram, the teacher starts with the student who was chosen most frequently. Representing boys by a triangle and girls by a circle, he puts the most frequently chosen individual near the center of the paper and draws lines to all the other individuals chosen by him and from all the others who chose him. Arrows indicate the direction of choice; the order of the choice—first, second, etc.—is placed directly above the line and near the center. The teacher then plots the rest of the class, always grouping the most frequently chosen toward the center of the page and placing mutual choices near each other. Those who have received no choices are placed on the outer edge of the sociogram. Those who have neither received nor made choices are on the outside away from the group so they can be located readily.

Practice is needed to make sociograms. The first one may take two hours or longer and will require considerable experimentation in placing the symbols on the chart.

INTERPRETING SOCIOMETRIC DATA. The score indicates the intensity and amount of interaction. The students with the highest scores are the most accepted and desired members of the class; those with the lowest, the least desired.

The use of triangles for boys and circles for girls makes it possible readily to determine the role of sex as the basis of choice. Except on the basis of sex, the sociogram does not reveal why choices were made as they were. Other information is necessary to determine why particular patterns are present.

The following will be found helpful in interpreting sociograms more fully: (1) Place IQ or achievement scores in the triangles and circles to see if they were determining factors in choice. (2) Find out the racial or national background of the students and the location of their homes, for these may have been a contributing factor. (3) Determine whether a student's physical development or chronological age contributed. (4) Observe the group informally to see whether you can account for the pattern shown by the sociogram.

It should be noted that the results and interpretation apply only to a particular group and that scores are dependent upon the questions used to elicit the student's choices and upon other factors. For example, the total number of pupils in the class and the ratio of boys to girls in the class greatly affect the scores each individual receives and, therefore, the interpretation.

CAUTIONS IN SOCIOMETRIC TESTING. In the sociometric tests described thus far, the student is not asked to nominate those he does not like or least likes to be seated near, work with on a school activity, invite home, and the like. This can be done, however, and often is. Similarly, variations[*] of sociometric test items used in research or by the teacher invite the student to make negative judgments about their classmates. In the "Guess Who" technique each student is asked to put in the name of the student who (guess who) fits such descriptions as:

Most talkative__________ Least talkative__________
Most liked__________ Least liked__________
Happy__________ Unhappy__________
Uses time well__________ Wastes time__________
Best in reading__________ Poorest in reading__________
Likes to recite__________ Dislikes to recite__________

To make the choices, the student is asked to make an unfavorable judgment, perhaps for the first time, about one or more of his classmates. Even when asked only to provide the names of friends or to guess who is happy, some incidental unfavorable comparing may be done. However, this is not deliberately encouraged by the administrator of the test.

Sociometric tests which elicit negative reactions to other students must be used with caution, if at all. They may provide useful information but also may initiate undesirable tensions and attitudes. Whoever administers such tests should assume full responsibility for possibly having encouraged a student for the first time to make an unfavorable judgment about a classmate with the approval of the administrator, and for having, perhaps unintentionally, encouraged the whole class in their out-of-class discussions of the test to categorize certain members of the class unfavorably. The giver of sociometric tests is obliged to use the information for constructive purposes and to answer any questions which parents of children rightfully raise after their children have informed them of the nature of the test. The latter applies, of course, to any information-gathering device.

PROJECTIVE TECHNIQUES

Published projective tests were described briefly in Chapter 15. Also in that chapter the difficulties that school and clinical psychologists and psychiatrists have in inferring personality characteristics from the responses of the individual were mentioned. Though this difficulty is a real one, teachers uneducated in the theory and inexperienced in the interpretation of projective tests experiment at times with a number of devices such as paintings, play activities, and open-end statements.

Young children in the primary grades usually enjoy finger painting. In a fifteen-minute period, a child may produce several paintings. Occasionally, these paintings are examined to estimate such characteristics of the child as rigidity–flexibility, introversion–extroversion, unhappy–happy. Also, the child may demonstrate his pleasant or unpleasant feelings toward self, classmates, teachers, or parents in his paintings.

In some clinical facilities, the child is given dolls of varying sizes and features to represent the persons in his immediate environment. On the basis of the child's reactions to the dolls and his responses to questions, the psychologist or psychiatrist infers the child's feelings to the people they represent. Children in school situations may also play with dolls and be observed and questioned by the teacher.

Open-end sentences, such as "I . . . ," "I like . . . ," "My teacher . . . ," "My school . . . ," "My parents . . . ," "The best . . . ," "The worst . . . ," "Sex . . . ," and the like are presented to the students with instructions to write whatever comes to mind as freely and fully as possible. On the basis of the responses, judgments are made about personal–social problems of the student, self concept, and many other personality variables.

If the teacher who is with the child daily cannot make reasonably adequate judgments about the child through careful observing, interviewing, and other previously discussed informal procedures, it is doubtful that a projective device will be of much value. If the judgments are made reliably on other bases, the projective device is not needed. Therefore, published and informal projective devices should remain the responsibility of the school psychologist, clinical psychologist, and psychiatrist. Any teacher who has a strong need to experiment with the informal type might first administer it to himself and then turn the results over to a psychologist or psychiatrist for interpretation.

SUMMARY

Teachers' observations of students' performances and behavior and other observational information may be utilized advantageously to achieve the first three purposes of evaluation stated in Chapter 15. Rating scales and check lists are often constructed to summarize the results of observations. The anecdotal record is another means of securing observations of the performances and behaviors of students. Developing criteria of good performances is essential to securing reliable and valid ratings of performance and behavior.

To achieve the many desirable outcomes that are possible, teacher-made tests must be carefully constructed and evaluated after being used. Objective and essay tests are generally used to ascertain how well students have learned. They may also be used to ascertain what the student knows or can perform before instruction begins.

Caution must be exercised in the classroom use of teacher-constructed self-reporting devices: the questionnaire, check list, diary, autobiography, interview, and sociometric tests. Useful evaluative information can be obtained with any of these; each can also be misused. The teacher or other person should know, before constructing and administering them, how the results will be used to improve the situation for those who respond.

With the widespread disagreement about interpretation of published projective tests, a person uneducated in the methods of personality appraisal should not attempt to devise projective tests, much less interpret the results. If the teacher cannot appraise the child's personality through daily observation and other informal techniques, it is doubtful that much insight will be gained through the teacher's attempting to use projective methods.

QUESTIONS AND ACTIVITIES

1. (a) Using the material in either Figure 16.1 or 16.2, discuss the number and types of evaluations the teacher makes about each student.
   (b) For which of these might standardized tests be used advantageously?
   (c) For which of these might teacher observations and other teacher-made devices be used advantageously?
2. Discuss the purposes of evaluation achieved through observation and evaluation in the arithmetic or science situation.
3. Construct a rating scale of any performance or behavior which you consider important and applicable to your professional interests.
4. Construct a check list for students' use in completing some project or other activity.
5. Construct a test, based on the material in this chapter. In your test, use at least one item of each type listed in the chapter. If possible, administer the test to others who have studied the chapter and evaluate your test on the basis of the results obtained.
6. Construct at least two items, based on the material in this chapter, to measure the following: application, analysis, and evaluation.
7. (a) Construct and, if possible, administer two essay items intended to measure the students' success in organizing and critically evaluating information presented in this chapter.
   (b) Construct and, if possible, administer short-answer items intended to measure each of the following: recall of information, ability to organize information, ability to evaluate information critically.
8. (a) List types of information which you think teachers might ethically secure from all their students by use of self-reporting devices, other than sociometric tests.
   (b) List the types of information you prefer not to supply to an instructor or other superior under any conditions.
   (c) Of the types of information given in (b), which would you freely provide if you were certain constructive uses would be made of it? (Note that· in responding to all parts of this question you are giving a self-report.)
9. Describe the conditions under which you would provide information freely about yourself in an interview.
10. Evaluate the guides proposed for conducting a conference or interview.
11. (a) What types of useful information may be secured through sociometric testing?
    (b) What additional information is needed to interpret the results obtained from sociometric testing?
12. How can the results of sociometric testing be helpful to the isolated student? the members of cliques? the popular students?

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Chapter 17 Statistical and Research Terminology

The purpose of this chapter is to clarify the more common statistical terms and symbols frequently encountered in research reports such as those listed in the Reference sections of the preceding chapters. The terms and symbols are defined in words, the formulas for handling simple statistics are given, and the computations needed to clarify the formulas are shown. The formulas and the computations are included to clarify terminology and symbols, not to provide models of statistical analysis. Most of the information used for illustrative purposes was gathered by the author and his research assistants during the period January, 1957, to June, 1959, on children of low intelligence enrolled in special classes for educable mentally retarded, and children of average and high intelligence in regular elementary school classes.

Some of this comprehensive information about the same children is presented in large tables, particularly Table 17.1, and is used throughout the chapter for illustrative purposes. This procedure was followed, rather than the typical one of presenting small bits of unrelated information about many groups of pupils, to enable the student to see relationships and to have practice material readily available if he needs it. The first four Questions and Activities at the end of the chapter, for example, are based on only a small amount of the total information but permit analysis and use of most of the statistics described in the chapter.

The person who has had courses in descriptive and inference statistics may find it profitable to scan the chapter simply to ascertain whether any new ideas are presented. The student with little previous work in statistics will find it necessary to read slowly and perhaps to perform the more simple calculations. Also, while studying research reports in which one or another of the statistical procedures has been employed, he may return to this chapter. Although it is helpful, it is not necessary to be able to compute the statistic in order to understand the results of a study. However the student must understand such vocabulary and use of statistics as: (1) measures of central tendency: mean, median, and mode; (2) partition values: quartiles, deciles, and percentiles; (3) measures of variability or dispersion:

TABLE 17.1. *Raw Scores for Fifteen Measures, or Variables, of a Random Sample of Forty Boys*

No. of Boy	Height	Weight	Strength of Grip	Number of Permanent Teeth	Carpal Age	IQ	Reading Achievement	Arithmetic Achievement	Language Achievement	Emotional Adjustment	Achievement in Relation to Expectancy	Integration of Self Concept	Expression of Emotion	Behavior Pattern	Child's Estimate of Own Abilities
1	55.0	75.5	21.6	21	99	107	141	123	131	6.0	5.0	6.0	5.5	5.5	5.0
2	53.6	74.5	20.3	13	108	105	123	123	125	3.0	2.5	3.5	6.0	6.0	2.5
3	62.8	116.0	21.6	15	137	109	143	132	136	4.5	4.0	6.0	5.0	4.5	3.5
4	54.3	83.6	20.1	12	120	113	126	125	123	5.5	4.5	5.5	7.0	5.0	5.0
5	56.6	79.5	21.8	19	120	110	122	118	112	3.0	3.0	3.5	7.5	7.5	3.0
6	52.3	57.3	15.0	13	101	101	137	132	129	3.0	4.0	3.0	4.5	7.5	3.5
7	53.6	74.5	23.2	12	113	101	136	122	125	4.0	2.5	6.0	5.0	6.0	4.0
8	48.1	53.9	15.7	12	98	109	122	125	135	1.5	2.5	3.5	1.0	4.0	6.0
9	50.3	56.5	19.0	20	111	106	124	129	119	6.5	6.0	6.5	6.5	6.0	5.0
10	55.1	74.3	19.1	20	126	107	128	125	127	2.5	2.5	2.0	2.0	2.5	2.5
11	54.4	67.5	21.6	12	119	104	117	122	121	3.5	4.0	5.0	4.0	3.5	2.5
12	57.5	83.5	28.5	12	144	112	136	134	134	4.0	3.0	3.0	6.0	6.5	4.5
13	57.0	82.8	25.8	13	116	102	131	125	137	5.5	4.5	5.0	7.0	6.5	4.5
14	56.8	78.0	22.5	12	113	118	128	132	129	4.0	4.0	4.0	6.5	5.0	5.5
15	47.9	49.3	15.9	13	89	101	121	116	122	4.0	5.0	4.5	2.5	3.0	2.5
16	52.8	66.3	21.8	12	120	109	143	132	134	5.0	5.5	5.5	6.0	6.5	5.5
17	55.0	77.5	20.0	12	117	112	145	123	135	3.5	3.5	3.5	3.0	2.5	3.5

18	59.1	113.3	28.2	28	144	114	147	125	127	4.5	4.5	4.5	7.0	6.0	5.0
19	51.9	62.0	14.9	18	116	100	132	115	118	3.5	4.0	3.5	4.5	5.5	4.5
20	57.8	84.3	24.3	11	120	123	160	136	141	5.0	5.5	5.5	6.0	5.5	4.0
21	54.4	73.5	21.2	12	114	128	170	133	147	6.0	5.5	6.5	5.5	4.5	5.0
22	54.5	72.0	22.8	13	120	117	154	136	147	3.0	4.5	2.5	6.0	6.5	4.0
23	55.3	73.5	23.4	12	108	128	154	138	142	4.5	4.5	4.5	4.5	5.0	3.5
24	56.0	77.0	26.3	12	144	128	159	138	153	3.0	3.5	4.0	5.5	5.5	3.5
25	56.0	84.0	24.3	12	120	120	148	130	137	3.0	5.0	5.5	4.5	6.0	5.0
26	56.0	76.3	18.4	12	118	123	166	134	151	3.5	4.5	4.5	3.5	4.5	3.5
27	58.4	78.0	22.7	15	123	123	164	129	145	5.0	5.0	5.0	5.5	5.5	4.5
28	59.1	83.0	20.5	12	119	130	170	142	148	3.0	6.5	6.0	7.0	7.5	3.5
29	54.4	84.0	20.5	13	132	139	160	140	140	7.5	6.5	7.5	5.0	5.5	4.5
30	54.3	90.0	18.5	13	108	146	172	139	151	3.5	3.0	3.5	6.5	6.5	4.5
31	53.1	89.0	15.0	12	123	76	86	95	91	1.5	3.0	2.0	4.5	4.5	5.5
32	56.0	69.0	21.6	11	114	71	85	98	85	6.0	5.0	5.5	6.0	5.5	5.0
33	53.4	66.3	18.0	16	113	85	87	99	92	2.0	2.5	2.0	6.5	8.0	3.0
34	52.9	62.1	17.7	22	119	82	86	91	86	2.5	2.5	3.0	3.0	4.0	3.0
35	52.5	66.5	18.6	12	105	70	91	89	82	4.0	5.0	4.0	7.0	6.5	5.0
36	52.5	58.6	15.4	14	99	70	85	97	87	5.0	4.5	4.5	5.5	6.0	7.0
37	48.6	45.5	11.9	12	105	75	80	87	72	5.5	3.5	4.5	6.5	6.0	4.0
38	54.3	101.0	13.0	26	131	73	100	99	98	5.0	4.5	5.0	4.5	4.5	3.5
39	52.8	90.0	17.8	14	140	52	81	88	72	4.0	4.0	3.5	3.5	3.5	4.5
40	52.4	91.0	23.2	15	102	65	86	94	84	6.0	6.0	7.5	7.0	7.0	7.0
M	54.47	76.01	20.29	14.5	117.2	104.1	128.65	120.25	121.75	4.14	4.23	4.51	5.25	5.44	4.28
σ	2.95	14.85	3.84	4.05	12.91	21.59	28.32	16.67	23.56	1.37	1.13	1.40	1.52	1.33	1.11

range, quartile deviation, mean or average deviation, and variance and standard deviation; (4) standard scores; (5) measures of relationship: product-moment coefficient of correlation, rank coefficient of correlation, and other correlation procedures and prediction; (6) sampling procedures: simple random sampling, stratified random sampling, and the normal distribution; (7) significance of differences; (8) factor analysis.

Most introductory statistics books treat all of the above except factor analysis. For a thorough treatment of introductory psychological statistics, see McNemar (1955).

MEASURES OF CENTRAL TENDENCY

Table 17.1 gives raw scores for fifteen measures or variables for forty boys. In the first column a number, from 1 to 40, is given to each boy. This series of numbers illustrates a *discrete* series; the total number of boys is obtained by counting each boy as a whole. Many other objects and events can also be counted as wholes and are not appropriately further divided into fractional parts. The numbers in each of the other fifteen columns are illustrative of a *continuous* series, although not arranged in sequential order. A continuous series of numbers implies gradations into fractional parts, with the whole number the midpoint. For example, Boys No. 2 and 9 have IQ's of 105 and 106, respectively. But the IQ scores were already rounded off to the nearest whole number with the fractional parts eliminated; we therefore state that an IQ of 105 lies between 104.50 and 105.49, 106 is between 105.50 and 106.49, and so on. In all illustrations throughout this chapter, computations are based on series of continuous numbers.

We often wish to describe a group of individuals in a classroom, school, or experimental situation by such terms as "typically" or "on the average" and for this purpose use a measure of central tendency which indicates where the scores are concentrated. Three measures of central tendency are the *mean*, *median*, and *mode*.

Mean

The mean is the arithmetic average of a set of scores, calculated by adding all the scores and dividing by the number of scores. For ungrouped data like that in Table 17.1, the formula for computing the mean is

$$\text{Mean, } M\text{, or } \bar{X} \text{ (read } X \text{ bar)} = \frac{\Sigma X}{N}, \tag{1a}$$

where

Σ = the sum of
X = each score,
N = the number of cases.

Applying the formula to IQ as shown in Table 17.1, we get

$$M = \frac{4164}{40} = 104.1.$$

A set of scores can be grouped into a frequency table, as has been done in Table 17.2 for carpal age of the forty boys. The scores from Table 17.1 are now combined into *class intervals,* and the number of boys whose scores fall into each class interval are listed under f (frequency). For the grouped data, the mean is calculated by

TABLE 17.2. Computation of the Mean of Carpal Age of Boys, Grouped Data

Class Interval	f	X	fX
140–144	4	142	568
135–139	1	137	137
130–134	2	132	264
125–129	1	127	127
120–124	8	122	976
115–119	7	117	819
110–114	6	112	672
105–109	5	107	535
100–104	2	102	204
95– 99	3	97	291
90– 94	0	92	000
85– 89	1	87	87
Total	40		4680

$$M = \frac{\Sigma f X}{N}, \tag{1b}$$

where

f = the frequency of each class interval,
X = the midpoint, or mid-value of the class interval.

The midpoint of the lowest class interval in Table 17.2, considered as starting at 84.5 and extending through 89.49, is 87.0. Other midpoints are located in the same manner. Applying Formula 1b to Table 17.2 information, we get

$$M = \frac{4680}{40} = 117.$$

The accuracy of the latter method of computing the mean, as compared with the first one, depends upon the number of class intervals and the number of cases. Although there is no fixed rule for deciding the number of class intervals into which to group scores, it is usually advisable to use not fewer than ten nor more than sixteen.

The mean is a better measure than the median (see below) if the value of all scores in a distribution are to be reflected in the measure of central tendency; the median is preferable where the value of the typical score is desired. For example, if five persons have annual incomes of \$4000, \$4500, \$5000, \$5500, and \$75,000, the mean is more appropriate for estimating income taxes which will be paid by the group; the median is better for estimating the standard of living of the group.

Median

The median is the point in a set of continuous measurements on both sides of which there is an equal number of cases. The calculation of the median of carpal age, using Table 17.2, is now described.

a. Divide the number of cases N by 2, $N/2 = 40/2 = 20$.

b. Determine by inspection the interval containing the median by counting up from the lower end of scores $N/2$, or 20, cases.

In our example the frequencies $1 + 0 + 3 + 2 + 5 + 6$ give a total of 17. The median, then, falls in the class interval 115-119. Notice that the lower limit of the interval lies halfway between the intervals that include scores of 110-114 and 115-119, that is, 114.5.

c. Now use the following formula:

$$\text{Median} = \text{L.L.} + \left[\frac{N/2 - f_{\text{up}}}{f_{\text{median}}}\right] \text{h}, \tag{2}$$

where

L.L. = the lower limit of the median class interval,
f_{up} = the total frequencies below the class interval in which the median falls,
f_{median} = the frequency of the median class interval,
h = the width of the class interval.

In our example, L.L. = 114.5, $f_{\text{up}} = 17$, $f_{\text{median}} = 7$, and $h = 5$.

Substituting in Formula 2,

$$\text{Median} = 114.5 + \left[\frac{40/2-17}{7}\right] \times 5 = 114.5 + \frac{3}{7} \times 5 = 116.64.$$

A more simple formula is available for computing the median; however, with minor substitution Formula 2 can be used for computing other points, as will be shown in the discussion of partition values.

Mode

The mode is the most frequently occurring X value, or score, in ungrouped data; or, in grouped data, the midpoint of the class interval which has the greatest frequency. For example, the mode number of permanent teeth of the boys shown in Table 17.3 is 12; 17 boys had 12 teeth. In Table 17.2, the mode of the carpal age is seen to be 122 (8 boys fell into that class interval, 120 to 124). The mode is a better indicator of the central tendency of the group in permanent teeth than it is in carpal age.

TABLE 17.3. Computation of the Mean Deviation of the Number of Teeth of Boys

X	f	$x = X - 14.5$	fx
28	1	13.5	13.5
27	0	0.0	0.0
26	1	11.5	11.5
25	0	0.0	0.0
24	0	0.0	0.0
23	0	0.0	0.0
22	1	7.5	7.5
21	1	6.5	6.5
20	2	5.5	11.0
19	1	4.5	4.5
18	1	3.5	3.5
17	0	0.0	0.0
16	1	1.5	1.5
15	3	.5	1.5
14	2	−.5	1.0
13	7	−1.5	10.5
12	17	−2.5	42.5
11	2	−3.5	7.5
Total	40		122.0

PARTITION VALUES

We often wish to know more about sets of scores than just the central tendency. If reading or IQ scores are available for larger groups, we may wish to divide the scores into fourths, tenths, and so on; or we may wish to compare the relative standing of one individual on several measures. Quite analogous to the median in computation are the quartiles, deciles, and percentiles referred to as partition values.

The quartiles (Q_n) divide the frequencies into four equal groups, the deciles (D_n) into ten, and the percentiles (P_n) into one hundred. The subscript n refers to the order of these values; for example, Q_3 is the third quartile and P_{10} is the tenth percentile. Q_1 has one-fourth of the cases below it; Q_3 has three-fourths of the cases below it; similarly P_{85} has 85 percent of the cases below it. Notice that the median $= Q_2$ (second quartile) $= D_5$ (fifth decile) $= P_{50}$ (fiftieth percentile). The fourth quartile, tenth decile, and one-hundredth percentile are not normally computed, for 100 percent of the cases fall below each of these.

The following formula can be used to calculate any partition value in a way similar to that used for the median.

$$\text{Any partition value} = \text{L.L.} + \left[\frac{\dfrac{nN}{m} - f_{\text{up}}}{f_{\text{v}}}\right] \times h, \tag{3}$$

where

n = the order of the desired value: 1st, 2nd, or 3rd quartile; or 1st, 2nd, . . . 9th decile; or 1st, 2nd, . . . 99th percentile;

m = the desired partition unit: 4 in the case of quartiles, 10 in deciles, and 100 in percentiles;

f_{v} = the frequency or number of cases in the class interval where the partition value is located;

h = the width of the class interval.

To illustrate use of the formula, let us calculate Q_3 of the carpal age of pupils from Table 17.2. In this case $n = 3$, $N = 40$, $m = 4$, and $h = 5$. These values can be substituted in the formula directly.

Counting up 30 cases to get three-fourths shows that Q_3 falls in the interval 120–124, with a lower limit of 119.5, a frequency of 8 (f_{v}), and 24 cases falling below that interval (f_{up}). Substituting in Formula 3,

$$Q_3 = 119.5 + \left[\frac{\dfrac{3 \times 40}{4} - 24}{8}\right] \times 5$$

$$= 119.5 + \frac{6 \times 5}{8} = 119.5 + 3.75 = 123.25.$$

Computing deciles and percentiles with fewer than 100 cases or subjects distorts the data somewhat; therefore the data in Table 17.2 are useful for illustrative purposes only. Using the same formula and procedure as for Q_3,

$$D_4 = 109.5 + \left[\frac{\dfrac{4 \times 40}{10} - 11}{6}\right] \times 5 = 109.5 + 4.17 = 113.67;$$

$$P_{40} = 109.5 + \left[\frac{\dfrac{40 \times 40}{100} - 11}{6}\right] \times 5 = 109.5 + 4.17 = 113.67.$$

MEASURES OF VARIABILITY OR DISPERSION

Besides knowing the central tendency of a set of scores, we also often want to know the highest and lowest score, the extent to which the scores are dispersed about the mean or other measure of central tendency, and the like.

The *variability* of a series of scores is the extent to which the scores are spread out along the scale from an average value such as mean, median, or mode. No one partition value such as Q_1 or P_2 is a direct measure of variability, but certain comparisons of partition values such as P_1 and P_{99}, or Q_1 and Q_3 yield a measure of variability.

Range

The range is the most simple measure of variability. It is the difference between the highest and lowest score. Since only the highest and the lowest score in the distribution are used, the range alone provides little useful information. As an example, the range of the number of permanent teeth of pupils, calculated from Table 17.3 $= 28 - 11 + 1 = 18$, or $28.499 - 10.5 = 18.0$. The 1 is added in the first computation to take care of the previously mentioned nature of continuous measures. In this connection, in actually obtaining number of permanent teeth, the dentist counted a tooth as permanent if the crown was exposed one-half or more above the gum.

Quartile Deviation

The quartile deviation, designated by the symbol Q, is calculated thus:

$$Q = \frac{Q_3 - Q_1}{2}. \tag{4}$$

The data in Table 17.2 may be used to calculate the quartile deviation of the carpal age of pupils. Q_3, previously calculated, is 123.5; similarly,

$$Q_1 = 104.5 + \left[\frac{\frac{1 \times 40}{4} - 6}{5}\right] \times 5 = 104.5 + 4 = 108.5.$$

By Formula 4,

$$Q = \frac{123.25 - 108.5}{2} = \frac{14.75}{2} = 7.38.$$

The quartile deviation is used primarily with nonsymmetrical sets of scores in which the median rather than mean is the better measure of central tendency.

Mean or Average Deviation

The deviation score is obtained by subtracting the mean of a set of scores from any score in the set; the remainder obtained is the deviation score. Since a raw score is usually indicated by the symbol X, a deviation score is usually designated by the symbol x; similarly, y is used for deviation score when Y is used to designate a raw score. Thus,

$$x = X - M. \tag{5}$$

The deviation score is negative when the mean exceeds the raw score and positive when the mean is less than the raw score. However, when adding the deviation scores as shown previously in Table 17.3 to obtain average deviation, the — sign is ignored. The average deviation of number of permanent teeth, with the information drawn from Table 17.3, is 3.05, or 122/40.

Variance and Standard Deviation

The variance and the standard deviation are widely used in describing the variation of a set of scores from the mean and also in testing hypotheses. The *variance* is defined as the mean of the squares of the deviations of the scores from their mean and is designated by the symbol s^2 or σ^2. The standard deviation is simply the square root of the variance and is designated by the symbols s or σ. The square root of $s^2 = s$. If scores have already been changed to deviation scores (x), the following formula is used to calculate the variance:

$$\text{Variance}, s^2, \text{or } \sigma^2 = \frac{\Sigma x^2}{N}. \tag{6a}$$

Most researchers have desk calculators available and many also use rapid electronic computers. These devices permit securing the variance, standard deviation, and many other measures described subsequently without grouping the scores. The raw scores are not put in rank order in most cases but appear as in Table 17.1. Increasingly, raw-score formulas are being used. The raw-score formula for variance follows:

$$\text{Variance}, s^2, \text{or } \sigma^2 = \frac{1}{N}\left[\Sigma X^2 - \frac{(\Sigma X)^2}{N}\right], \tag{6b}$$

where

N = number of cases,
ΣX^2 = square of each score, subsequently added together or summed,
$(\Sigma X)^2$ = sum of all the scores, squared.

Formula 6b is used to illustrate computation of the variance and the standard deviation of IQ from the data in Table 17.1. In this case, $N = 40$, $\Sigma X = 4164$, and $\Sigma X^2 = 452{,}116$.

$$\text{Variance}, s^2, \text{or } \sigma^2 = \frac{1}{40}\left[452{,}116 - \frac{(4164)^2}{40}\right] = 466.1281;$$

$$\text{Standard deviation}, s, \text{or } \sigma = \sqrt{466.1281} = 21.59.$$

The standard deviations of the fifteen variables in Table 17.1 are calculated and listed in the row designated σ. Recall that in raw-score form without grouping the data into a frequency table, the mean, M, or $\bar{X} = \frac{\Sigma X}{N}$; note that no new symbols are used in the formula for variance and standard deviation. It will be seen subsequently that N, $\overline{X}$ or M, ΣX, ΣX^2, and $(\Sigma X)^2$ are also the basic data in computing standard scores and correlations from ungrouped data.

STANDARD SCORES

In Table 17.1, a variety of measurements is given: height in inches, weight in pounds, strength of grip in kilograms, number of permanent teeth, carpal age in months, IQ scores, reading, arithmetic, and language achievement in months, and ratings of six personality variables. To read across the rows for each boy is quite meaningless, because the numbers are not in comparable units. One means of getting more meaningful scores is to change each set of scores to percentile scores as shown previously. A more precise means is to change each set of scores to standard scores. A standard score, usually called sigma score or *z*-score, is a score derived from a set of raw scores by expressing each raw score as a deviation from the group mean in standard deviation units. Standard scores are useful in comparing measurements on unlike scales and with different variabilities as indicated above. To change a raw score, X, to a standard score or *z*-score, calculate the mean, M, and the standard deviation, σ, of the complete set of scores and then substitute in the formula:

$$\text{Standard, or } z\text{-score} = \frac{X - M}{\sigma}. \qquad (7)$$

Just as deviation scores, previously discussed, can be negative or positive so also can standard scores. Most standard scores fall within the range of $+3.0$ to -3.0, and the algebraic sum of a set of standard scores is always 0.

As an illustration of the usefulness of standard scores, Boy 29 in Table 17.1 has an arithmetic age of 140 months; his language age is also 140 months. These months of age were obtained by first getting a raw score and then going to a table of norms in order to change the scores to months of age. This was necessary because the obtained raw scores were not comparable for low-IQ and the other boys. Though Boy 29 shows the same achievement level on the national sample, how does he compare in arithmetic and language with the other forty boys in this particular group? We shall also show his *z*-score in IQ, emotional adjustment, and number of permanent teeth. By changing his scores to standard scores, we find that

$$z \text{ (for arithmetic)} = \frac{140 - 120.25}{16.67} = \frac{19.75}{16.67} = +1.19$$

$$z \text{ (for language)} = \frac{140 - 121.75}{23.56} = \frac{18.25}{23.56} = +0.78$$

$$z \text{ (for IQ)} = \frac{139 - 104.1}{21.59} = \frac{34.9}{21.59} = +1.62$$

$$z \text{ (for emotional adjustment)} = \frac{7.5 - 4.14}{1.37} = \frac{3.36}{1.37} = +2.45$$

$$z \text{ (for number of permanent teeth)} = \frac{13 - 14.5}{4.05} = \frac{-1.5}{4.05} = -0.26.$$

The above *z*-scores show that this boy, in comparison with the other boys, was above the mean in all except number of teeth. In relation to himself, he was highest in emotional adjustment, next high in IQ, and so on. And finally, his *z*-scores for achievements in language and arithmetic were lower than for IQ; on the average other boys' achievements in arithmetic and language were higher in relation to their IQ's.

MEASURES OF RELATIONSHIP

One of the important problems facing psychologists and educators is to ascertain the relationships among sets of measurements of the same individuals; for example, the relationship between IQ and achievement, between interest and achievement, between intellectual and psychomotor abilities, between success in school and success in out-of-school activities.

In the study from which the information in this chapter was drawn, we were concerned, among other things, with the relationships among various physical, intellectual, social, and emotional measures. After ascertaining the relationships among fifteen sets of measures for boys (and for girls), we were further concerned with ascertaining the extent to which growth during a period of one year is composed of general, group, or specific factors. After securing the measures on a stratified random sample (to be discussed later) of boys and girls from a larger child population, we computed correlations among the sets of measures.

The term "correlation" refers to the relationship between two or more variables such as height, weight, IQ, and the like. The *coefficient of correlation,* a number, indicates the magnitude and direction of the relationship. Which of several methods of computing correlation should be used depends on the type of numerical information obtained, the number of variables under consideration, and the method of treating the variables. Product-moment, rank, partial, and multiple coefficients of correlation will be discussed here.

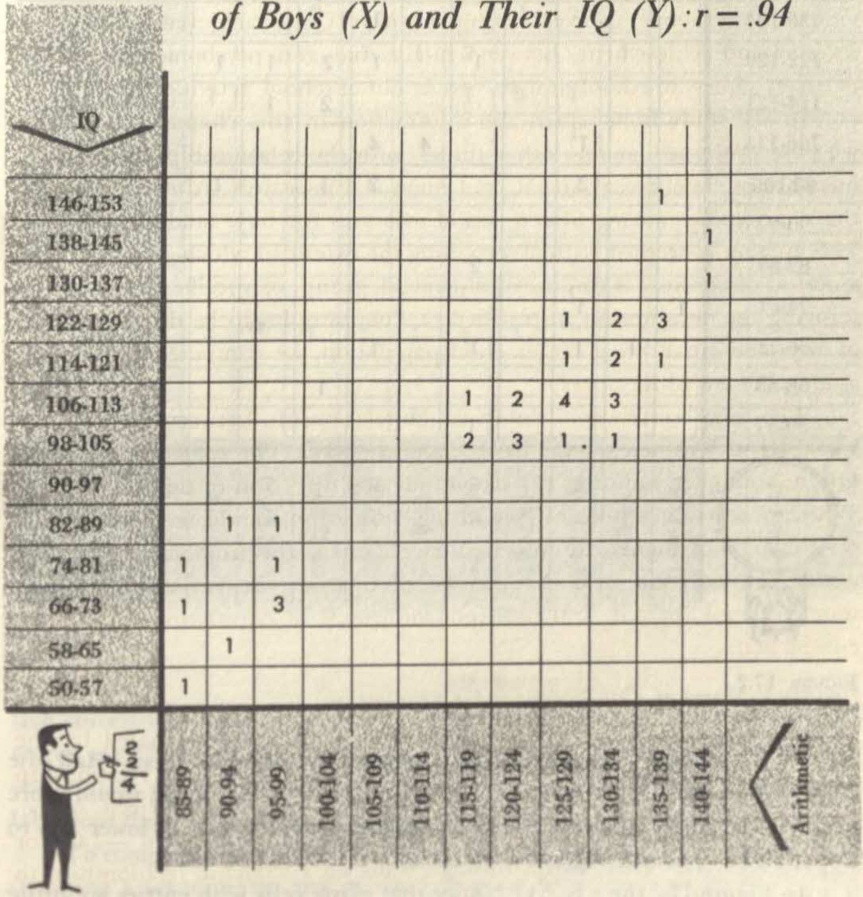
Product–Moment Coefficient of Correlation

The product-moment coefficient of correlation, usually designated by the symbol r, is a widely employed statistic, devised as a measure of relationship between two sets of measurements (variables) on the same subjects, or between measurements on pairs of subjects. The r can range from -1.00 for a perfect inverse relationship, through 0 for no systematic relationship, to $+1.00$ for perfect direct relationship.

In interpreting a high correlation between two variables, it is incorrect to conclude that one variable "causes" the other. Another alternative is that both variables may be influenced by some common factor or factors. Another caution is that r cannot be interpreted as a percentage; an r of .60 does not mean 60 percent relationship. Similarly, an r of .60 does not indicate twice the relationship shown by an r of .30. Also, r is entirely independent of the units in which the two variables are expressed; for example, the boys' height in inches can be correlated with their weight in pounds or with carpal age in months. The meaning of correlation may be brought out more clearly by constructing a scattergram, a graph on which the two scores of the same individuals are plotted.

Figures 17.1, 17.2, and 17.3 are scattergrams which present the meaning of r's of varying size graphically. Figure 17.1 is for IQ and arithmetic, where $r = .94$; Figure 17.2 is for IQ and strength of grip, where $r = .51$;

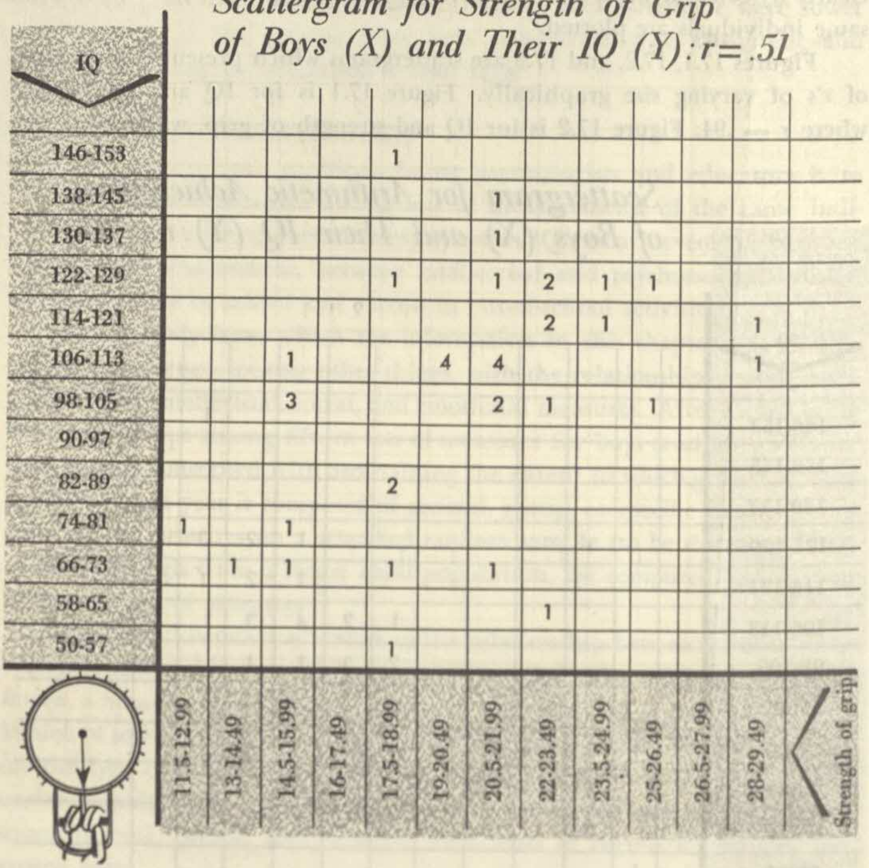
Scattergram for Arithmetic Achievement of Boys (X) and Their IQ (Y): $r = .94$



IQ	85-89	90-94	95-99	100-104	105-109	110-114	115-119	120-124	125-129	130-134	135-139	140-144
146-153											1	
138-145												1
130-137												1
122-129									1	2	3	
114-121									1	2	1	
106-113							1	2	4	3		
98-105							2	3	1	1		
90-97												
82-89		1	1									
74-81	1		1									
66-73	1		3									
58-65		1										
50-57	1											

FIGURE 17.1.

Figure 17.3 is for carpal age and language achievement, where $r = .16$. To interpret Figure 17.1, note that three boys had IQ's between 66-73 and arithmetic ages of 95-99; similarly, three had IQ's of 122-129 and arithmetic ages of 135-139; all other entries are interpreted in the same way. Figure 17.1 shows a high positive relationship between IQ and arithmetic; the higher



Scattergram for Strength of Grip of Boys (X) and Their IQ (Y): r = .51

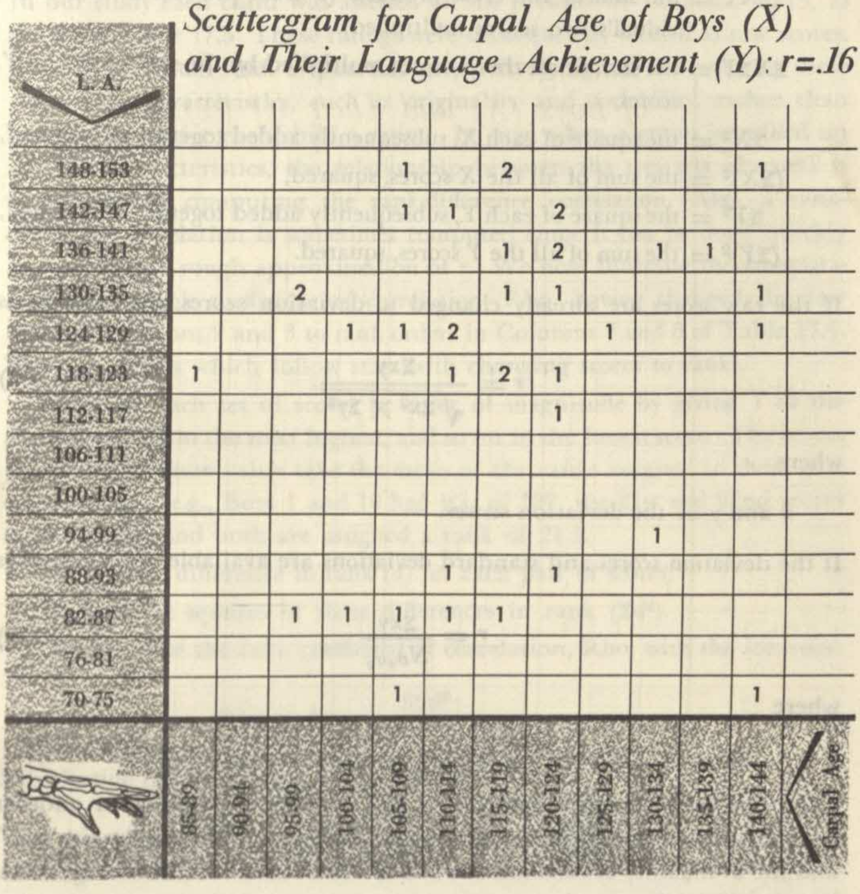
IQ	11.5-12.99	13-14.49	14.5-15.99	16-17.49	17.5-18.99	19-20.49	20.5-21.99	22-23.49	23.5-24.99	25-26.49	26.5-27.99	28-29.49	
146-153					1								
138-145							1						
130-137							1						
122-129					1		1	2	1	1			
114-121								2	1			1	
106-113			1			4	4					1	
98-105			3				2	1		1			
90-97													
82-89					2								
74-81	1		1										
66-73		1	1		1		1						
58-65								1					
50-57					1								

FIGURE 17.2.

the IQ, the higher the arithmetic achievement, and vice versa. Had the correlation been 1.00 instead of .94, every boy's set of two scores would more nearly have fallen in the twelve cells running diagonally from lower left to upper right. The scattergram is 13 by 12.

In Figure 17.2 the r is .51. Notice that many cells with entries are quite distant from a diagonal line from lower left to upper right, and also that the six boys with strongest grip had IQ's of 98-129 and that three with IQ's above 130 were of about average strength. Figure 17.3 shows a correlation of .16 (near 0, or no relationship). Two boys of highest carpal age, 140-144, have the lowest and highest language scores—70-75 and 148-153, respectively.

The size of negative correlations has the same meaning as that of posi-



Scattergram for Carpal Age of Boys (X) and Their Language Achievement (Y): r=.16

L. A.	85-89	90-94	95-99	100-104	105-109	110-114	115-119	120-124	125-129	130-134	135-139	140-144
148-153					1		2					1
142-147					1	1		2				
136-141							1	2		1	1	
130-135			2				1	1				1
124-129				1	1	2			1			1
118-123	1					1	2	1				
112-117								1				
106-111												
100-105												
94-99										1		
88-93						1		1				
82-87			1	1	1	1	1					
76-81												
70-75					1							1

FIGURE 17.3.

tive correlations; however, the relationship is inverse. In a scattergram the scores would lie along a line going from upper left to lower right. The scattergram can be used directly for computing *r*, but the process is more laborious than using a desk calculator and Formula 8a, 8b, or 8c.

To compute *r* for two sets of scores, referred to as *X* and *Y*, without constructing a scattergram, any of the following formulas may be used. If a calculator is available and raw scores are used, the formula is

$$r = \frac{N\Sigma XY - \Sigma X \Sigma Y}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2]\,[N\Sigma Y^2 - (\Sigma Y)^2]}} \qquad \text{(8a)}$$

where

N = the number of cases,

ΣXY = the sum of the cross products (a cross product is each individual's two scores multiplied),

$\Sigma X \Sigma Y$ = the sum of all the X scores multiplied by the sum of all the Y scores,

ΣX^2 = the square of each X, subsequently added together or summed,

$(\Sigma X)^2$ = the sum of all the X scores, squared,

ΣY^2 = the square of each Y, subsequently added together or summed,

$(\Sigma Y)^2$ = the sum of all the Y scores, squared.

If the raw scores are already changed to deviation scores, the formula is

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \times \Sigma y^2}} \qquad \text{(8b)}$$

where

x and y = the deviation scores.

If the deviation scores and standard deviations are available, the formula is

$$r = \frac{\Sigma xy}{N\sigma_x\sigma_y} \qquad \text{(8c)}$$

where

σ_x and σ_y = the standard deviations of the two sets of scores.

Formulas 8a, 8b, 8c get identical r's and whether to use one or another depends in part on whether additional information is desired, the size of N, and the availability of calculators. The raw-score form results in large numbers as will be shown subsequently.

Table 17.4 (columns 2 to 6) illustrates the computation of r between IQ and reading achievement, using Formula 8a. From Table 17.4, $N = 40$, $\Sigma X = 4164$, $\Sigma Y = 5146$, $\Sigma X^2 = 452{,}116$, $\Sigma Y^2 = 694{,}108$, and $\Sigma XY = 558{,}594$. Substituting in Formula 8a,

$$r = \frac{(40 \times 558{,}594) - (4164 \times 5146)}{\sqrt{[(40 \times 452{,}116) - (4164)^2]\;(40 \times 694{,}108) - (5146)^2}}$$

$$= \frac{915{,}816}{\sqrt{745{,}744 \times 128{,}3004}} = \frac{915{,}816}{978{,}172} = .936.$$

The correlations among the fifteen variables previously given in Table 17.1 are calculated and presented in the correlation table in Table 17.5. The r is .75 between height and weight, .33 between height and expression of emotion, and .69 between emotional adjustment and achievement in relation to expectancy. Other entries are read in the same way.

Rank Coefficient of Correlation

In our study each child was assessed on six personality variables, 10-15, as shown in Table 17.5 These ratings were subsequently treated as raw scores. But teachers often rank a classroom group from highest to lowest on these and other characteristics, such as originality and sociability, rather than attempting to give each child a rating. In turn when a group is ranked on any two characteristics, the relationship between the two sets of ranks is ascertained by computing the rank-difference correlation. Also, a rank-difference correlation is sometimes computed since it can be done quickly and provides a rough approximation of r. We now illustrate the computation of the rank coefficient of correlation, Rho, having changed the raw scores in Columns 2 and 3 to rank orders in Columns 7 and 8 of Table 17.4. The suggestions which follow start with changing scores to ranks.

a. Rank each set of scores in order of magnitude by giving 1 to the highest score, 2 to the next highest, and so on to the lowest score. The scores that have the same value take the mean of the ranks assigned to them as a common rank, e.g., Boys 1 and 10 had IQs of 107, the 21st and 22nd scores from the top, and both are assigned a rank of 21.5.

b. Get the difference in rank (d) for each pair of scores.

c. Sum the squares of these differences in rank (Σd^2).

d. Calculate the rank coefficient of correlation, Rho, with the formula:

$$\text{Rho} = 1 - \frac{6\Sigma d^2}{N\,(N^2 - 1)}. \qquad (9)$$

Substituting in the above formula from Table 17.4,

$$\text{Rho} = 1 - \frac{6 \times 1082}{40(1600 - 1)} = 1 - \frac{6492}{63960} = .90.$$

This Rho of .90 between IQ and reading compares with an r of .94 obtained by the product-moment method.

Other Correlation Procedures and Prediction

Both partial and multiple correlation are used to ascertain relationships among more than two measures. A main purpose of securing a correlation is to make more accurate predictions; this calls for regression equations. Each of these is illustrated to clarify the meanings.

Sometimes three variables vary simultaneously but we have not been able to eliminate the effects of one of them experimentally. This may occur

TABLE 17.4. Computation of Product-Moment Correlation Between IQ (X) and Reading Achievement (Y) of Boys and Rank Coefficient of Correlation for X and Y

	X	Y	X^2	Y^2	XY	Rank X	Rank Y	d	d^2
1	107	141	11449	19881	15087	21.5	16	5.5	30.25
2	105	123	11025	15129	12915	24	26	2.0	4.00
3	109	143	11881	20449	15587	19	14.5	4.5	20.25
4	113	126	12769	15876	14238	14	24	10.0	100.00
5	110	122	12100	14884	13420	17	27.5	10.5	110.25
6	101	137	10201	18769	13837	28	17	11.0	121.00
7	101	136	10201	18496	13736	28	18.5	9.5	90.25
8	109	122	11881	14884	13298	19	27.5	8.5	72.25
9	106	124	11236	15376	13144	23	25	2.0	4.00
10	107	128	11449	16384	13696	21.5	22.5	1.0	1.00
11	104	117	10816	13689	12168	25	30	5.0	25.00
12	112	136	12544	18496	15232	15.5	18.5	3.0	9.00
13	102	131	10404	17161	13362	26	21	5.0	25.00
14	118	128	13924	16384	15104	11	22.5	11.5	132.25
15	101	121	10201	14641	12221	28	29	1.0	1.00
16	109	143	11881	20449	15587	19	14.5	4.5	20.25
17	112	145	12544	21025	16240	15.5	13	2.5	6.25
18	114	147	12996	21609	16758	13	12	1.0	1.00
19	100	132	10000	17424	13200	30	20	10.0	100.00

20	123	160	15129	25600	19680	8	6.5	1.5	2.25
21	128	170	16384	28900	21760	5	2.5	2.5	6.25
22	117	154	13689	23716	18018	12	9.5	2.5	6.25
23	128	154	16384	23716	19712	5	9.5	4.5	20.25
24	128	159	16384	25281	20352	5	8	3.0	9.00
25	120	148	14400	21904	17760	10	11	1.0	1.00
26	123	166	15129	27556	20418	8	4	4.0	16.00
27	123	164	15129	26896	20172	8	5	3.0	9.00
28	130	170	16900	28900	22100	3	2.5	.5	.25
29	139	160	19321	25600	22240	2	6.5	4.5	20.25
30	146	172	21316	29584	25112	1	1	0.0	.00
31	76	86	5776	7396	6536	33	35	2.0	4.00
32	71	85	5041	7225	6035	36	37.5	1.5	2.25
33	85	87	7225	7569	7395	31	33	2.0	4.00
34	82	86	6724	7396	7052	32	35	3.0	9.00
35	70	91	4900	8281	6370	37.5	32	5.5	30.25
36	70	85	4900	7225	5950	37.5	37.5	0.0	.00
37	75	80	5625	6400	6000	34	40	6.0	36.00
38	73	100	5329	10000	7300	35	31	4.0	16.00
39	52	81	2704	6561	4212	40	39	1.0	1.00
40	65	86	4225	7396	5590	39	35	4.0	16.00
Σ	4164	5146	452116	694108	558594				1082.00

TABLE 17.5 Matrix of Correlations Among the Fifteen Variables in Table 17.1

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Height		.75	.65	.08	.61	.40	.48	.44	.43	.07	.13	.15	.33	.13	−.14
2	Weight			.46	.28	.66	.16	.25	.19	.19	.10	.10	.20	.25	.01	.06
3	Strength of grip				−.07	.45	.45	.47	.51	.48	.18	.17	.26	.38	.22	.06
4	No. of permanent teeth					.23	−.18	−.16	−.21	−.20	.06	−.07	−.06	.00	−.04	−.10
5	Carpal age						.15	.21	.19	.16	−.02	−.06	−.06	.08	−.10	−.16
6	IQ							.94	.94	.94	.01	.15	.16	.05	.05	−.22
7	Reading achievement								.93	.96	.07	.27	.24	.04	.05	−.17
8	Arithmetic achievement									.97	.04	.21	.20	.04	.08	−.18
9	Language achievement										−.03	.16	.15	−.05	−.01	−.20
10	Emotional adjustment											.69	.79	.40	.09	.36
11	Achievement in relation to expectancy												.76	.32	.18	.35
12	Integration of self concept													.29	.11	.34
13	Expression of emotion														.78	.26
14	Behavior pattern															.22
15	Child's estimate of own ability															

when age of pupils in a classroom varies. Age may also affect the relationship between such measures as reading and arithmetic achievement. The partial coefficient of correlation is used to ascertain the relationship between any two variables while the third is kept constant.

At times we want to know the combined relationship between two or more variables, called *independent variables,* and a third one, called the *dependent variable,* so that we can predict the third more reliably. The multiple coefficient of correlation (R) is a measure of the combined relationship between a dependent variable and a series of independent variables. For example, the R of weight and grip on height, based on the information in Table 17.1, is .83.

A main reason for finding relationships is to make more accurate predictions, for example, from IQ to school achievement in a subject field or from interest scores to performance in an occupation. Regression equations are computed for this purpose. They may be based on a simple r between two measures or upon any number of independent variables and a dependent variable. For example, using the information from Table 17.4, we secure a regression equation, and the predicted reading score $= 1.228X + .0047$, where X is IQ score.

SAMPLING PROCEDURES

Classroom teachers are most concerned with the characteristics of the pupils in their classes as are parents about their own children. Researchers, however, attempt to ascertain characteristics of children or of human beings generally, in the hope that generalizations may be found which have wide applicability. Assume that some researchers wanted to identify the cognitive abilities of children at each age level, six through eighteen. We already know such things as (1) cognitive abilities differ somewhat according to age, sex, rural–urban community, and subcultural groups (Chapter 3); (2) our present means of identifying known cognitive abilities range from crude to good (see Chapters 15 and 16); (3) some cognitive abilities are not yet identified, as shown in Chapters 1, 6, and 7. Therefore, instead of trying to identify the cognitive abilities of seven-year-olds by attempting to test and assess every seven-year-old in the United States, we take samples of seven-year-olds from various locations in the United States in order to save time and money.

Population and Sample

A sample is a subset or subgroup of an entire group, called a population. Sampling is used to save time and money, and may provide opportunities for better control that can be had when the whole population is used. Sampling is used in order to generalize from a sample to a population. But to generalize from any sample to a population involves uncertainty. The amount of uncertainty or risk of error can be determined if the sample used is a probability sample, that is, a sample in which every member of the population is ensured a known or determinable chance of being drawn in the sample. Among the many types of probability sampling, only simple random and stratified random sampling will be discussed.

SIMPLE RANDOM SAMPLING. A simple random sample is one in which the members of a defined population are drawn in such a way that each one of the population has an equal chance of being included in the sample, and every possible combination of members in the population has the same chance of being included. For example, if the entire population of seven-year-old girls in a city is 5000 and a sample of 500 is desired, each of the 5000 has an equal chance of being drawn into the sample of 500. This also permits every possible combination to be drawn into the sample. A table of random numbers is usually used for selecting a simple random sample.

STRATIFIED RANDOM SAMPLING. In this type, the population is divided into subgroups, called strata, on the basis of some characteristic. Then, a simple random sample is selected from each stratum. In connection with the data presented in Table 17.1, the population was first identified on the basis of chronological age, sex, and IQ level. Then, a simple stratified sample was drawn of 40 boys to include 10 of high IQ, 20 of average IQ, and 10 of low IQ. The intent was to secure a sample from the larger population of boys with IQ's normally distributed.

The Normal Distribution

The normal curve is symmetrical about the mean and has its maximum height above the mean. Therefore, the mean, the median, and the mode coincide in the normal distribution. Figure 3.1 of Chapter 3, which presents the curve of the 2904 IQ scores of the sample on which the 1937 Revised Stanford-Binet Scale was standardized, closely approximates a normal distribution. The idea of normality applies to the shape or form of the distribution but not to any other properties that the distribution may have, such as the mean and standard deviation. Thus, one distribution has a mean of 10 and a standard deviation of 3, whereas another has a mean of 80 and a standard deviation of 12. The scores in these two sets of data may be changed to standard scores, and in both cases the mean of the standard scores equals 0 and the standard deviation 1, as noted before in this chapter. The various frequencies with which the values of a variable occur in the population can be expressed as proportions by dividing each frequency by the size of the population. Since the sum of all proportions must equal 1, the area under the normal curve can be made unity regardless of the number of cases involved. These two processes—changing raw scores to z or standard scores, and changing frequencies to proportions—illustrate that a normal distribution is independent of the number of cases, mean, and standard deviation.

For any amount of deviation from the mean that is expressed in standard deviation units, a normal probability table can be used to ascertain the proportion of the total area under the normal curve corresponding to that deviation. For example, about .34 of the area lies on each side of the mean up to a point of one standard deviation away; and thus about .68 of the area lies between $+1\sigma$ and -1σ, as can be seen in Figure 17.4. The area between $+1.96$ and -1.96 standard deviation units includes .95 of the area; thus .05 of the area lies beyond ± 1.96 standard deviation units. Moreover, .997 of the area of a probability curve lies between $+3\sigma$ and -3σ.

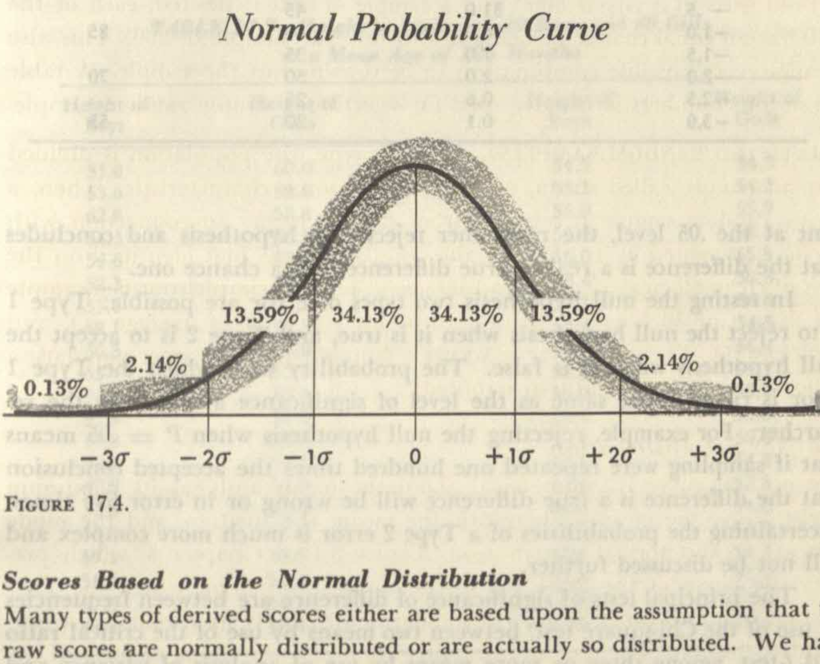


FIGURE 17.4.

Scores Based on the Normal Distribution

Many types of derived scores either are based upon the assumption that the raw scores are normally distributed or are actually so distributed. We have now shown that the value of M, Q_2, Median, D_5 P_{50}, and a z score of 0 are identical when the scores are normally distributed. Table 17.6 shows the relation of various scores derived from a large set of normally distributed raw scores or from a large set of raw scores "smoothed out" to fit a normal distribution.

SIGNIFICANCE OF DIFFERENCES

A number of tests of significance are available to ascertain the extent to which the differences between or among obtained measures–for example, between two means or among three or more means–are chance or true differences. Also, in many experiments hypotheses are stated as null hypotheses; that is, the difference between or among groups is not statistically significant. Experimenters often accept some probability level, such as .05 or .01, for rejecting the null hypothesis; that is, if the difference is signifi-

TABLE 17.6. ***Relations Among Various Scores When the Raw Scores Are Normally Distributed***

Distance from Mean in σ Units (z Score)	Percentile Score	*T* Score when $M = 50$, $\sigma = 10$	Deviation IQ when $M = 100$, $\sigma = 15$
3.0	99.9	80	145
2.5	99.4	75	
2.0	98.0	70	130
1.5	93.0	65	
1.0	84.0	60	115
.5	69.0	55	
0	50.0	50	100
− .5	31.0	45	
−1.0	16.0	40	85
−1.5	7.0	35	
−2.0	2.0	30	70
−2.5	0.6	25	
−3.0	0.1	20	55

cant at the .05 level, the researcher rejects the hypothesis and concludes that the difference is a real or true difference, not a chance one.

In testing the null hypothesis two types of error are possible: Type 1 is to reject the null hypothesis when it is true, and Type 2 is to accept the null hypothesis when it is false. The probability with which the Type 1 error is risked is the same as the level of significance accepted by the researcher. For example, rejecting the null hypothesis when $P = .05$ means that if sampling were repeated one hundred times the accepted conclusion that the difference is a true difference will be wrong or in error five times. Ascertaining the probabilities of a Type 2 error is much more complex and will not be discussed further.

The principal tests of significance of difference are between frequencies by use of the Chi-square test, between two means by use of the critical ratio and *t*-test, among three or more means by use of analysis of variance and the *F*-test, and among three or more means of dependent or correlated measures by use of analysis of covariance and the *F*-test. The tests are used in many references cited at the end of chapters in this book. All of these tests yield a numerical value; in turn, this numerical value is compared with other values in various statistical tables to ascertain the extent to which the obtained difference is due to chance. One example of each test is given to show how to interpret the test.

Chi-Square Test

In the present study the fathers of fifteen boys of average IQ and of thirty-four boys of high IQ were in professional, semiprofessional, managerial, or official occupations; the fathers of twenty-five boys of average IQ and of six boys of high IQ were in clerical, sales, service, and labor occupations. Applying the Chi-square test to these frequencies, we found that the chances were less than 1 in 1000, .001, that the occupational categories of the fathers of the average and high IQ boys were the same, and concluded that there was a true difference between the occupation of fathers of average and high IQ boys in our study and in the population from which the sample was drawn.

Critical Ratio Test

Table 17.7 gives the heights of two samples of 40 boys and 40 girls, with the means and standard deviations listed at the bottom. To what extent is the obtained difference in mean height between the boys and girls statistically significant? The critical ratio (CR) was computed and found to be .873. The probability of getting a CR of .873 by chance is .38. Had the researcher chosen a level of significance at the 5 percent level, he would conclude that the difference between the two means is not statistically significant; had he hypothesized that the mean heights of boys and girls is the same at a mean age of 125 months (null hypothesis), he would accept the hypothesis.

TABLE 17.7. Height in Inches of 40 Boys and 40 Girls at a Mean Age of 125 Months

Height of Boys	Height of Girls	Height of Boys	Height of Girls
55.0	60.0	54.5	56.3
53.6	58.8	55.3	54.2
62.8	58.8	56.0	55.9
54.3	52.1	56.0	52.3
56.6	57.5	56.0	55.5
52.3	52.2	58.4	50.8
53.6	52.5	59.1	56.6
48.1	55.5	54.4	54.5
50.3	51.0	54.3	56.4
55.1	53.6	53.1	50.1
54.4	58.0	56.0	55.4
57.5	51.8	53.4	55.8
57.0	58.3	52.9	50.8
56.8	56.8	52.5	54.8
47.9	55.6	52.5	57.3
52.8	52.8	48.6	54.8
55.0	54.6	54.3	54.0
59.1	55.5	52.8	54.7
51.9	56.6	52.4	52.8
57.8	56.4	*M* 54.47	55.0
54.4	58.4	*σ* 2.95	2.46

t-Test

The *t*-test for significance of difference between means follows the same theoretical framework and interpretation as does the critical ratio. However, the *t*-test is a good test of the significance of difference with *N*'s under 30, whereas the critical ratio is not.

Analysis of Variance and F-Test

In many experiments, more than two samples are used or more than two treatments or methods are applied to the same sample. If five samples are used, the previous method of CR can be employed to ascertain the significance of difference between every set of two means, but this is an inefficient procedure; and to some extent it is not a good test of significance among the five means. The analysis of variance is a more efficient method and can be used to obtain a numerical value F which is interpreted much the same as the CR and t-test.

In the majority of research reports, the lengthy computations which are necessary to arrive at the value of F are not given, nor are the raw scores. Table 17.8 shows the results of the analysis of variance and the F value in the usual table form encountered in research reports. Computation of the sum of squares is not shown. The method for obtaining degrees of freedom (*df*) is also not given. The mean square deviation is obtained by dividing the sum of squares by the corresponding degrees of freedom; e.g., 29.02/2. Entering an F table with the proper degrees of freedom, 2 and 117, we find that the obtained F of 3.144 is not significant at the .01 level but is at the .05 level; (an F of 3.08 is significant at the .05 level). If one accepts the .01 level of significance, he accepts the hypothesis that the difference among the means is not significant; if one accepts $P = .05$ he rejects the hypothesis and concludes that there is a real difference. The F-test applies to the difference among the three means; it does not answer which sets of two means are different or the extent of the difference. The researcher who accepts $P = .01$ does nothing further to clarify the differences; the one who accepts $P = .05$ subsequently applies other tests to ascertain the significance of difference between each set of two means.

TABLE 17.8. Results of Analysis of Variance of Acquisition Scores in Subtraction

Source of Variance	Sum of Squares	*df*	Mean Square Deviation	*F*
Among groups	29.02	2	14.51	3.144
Within groups	539.97	117	4.615	
Total	568.99	119		

The analysis of covariance is used to control a variable much the same as in partial correlation. The F-test is applied, however, and interpreted in the same manner as for analysis of variance.

FACTOR ANALYSIS

Factor analysis, an extension of correlation techniques and analysis of variance, is widely used to identify human abilities and characteristics. The measures of the abilities or characteristics must be reduced to numbers whereby r's can be obtained among the various tests, ratings, and the like. We shall refer to all such measures as tests. Once a table of r's or correlation matrix is completed, as shown previously in Table 17.5, the data can be submitted to factor analysis with the possibility of identifying three types of factors—general, group, and specific. A general factor is one found in all the tests. A group factor is one found in more than one, but not in all the tests. A specific factor is present in one test but not in any other. Whether a general, group, or specific factor is identified depends partly on the measures originally selected and correlated. If we give only five vocabulary tests, we are likely to find a general vocabulary factor present in all five tests. Combine five numerical tests with the five vocabulary tests, and we are likely to identify two group factors—numerical and vocabulary. If all ten tests correlate high, positively and significantly, we will also identify a general factor.

We now turn to a more specific problem for illustrative purposes. If it is desired to identify mentally retarded and academically talented boys in the elementary school, how much weight should be given to the physical measures of height, weight, carpal age, and how much to IQ? Let us assume that high achievements in arithmetic, reading, and language are characteristic of the academically talented and that low achievements in the same subject-matter areas are characteristic of the mentally retarded.

The r's among height, weight, carpal age, IQ, reading, arithmetic, and language, as given previously in Table 17.5, were analyzed to ascertain the extent to which there might be separate, group, or general factors present in the seven measures. By use of Thurstone's (1947) centroid method of factor analysis and a graphical rotation, two group factors were identified with loadings as shown in Figure 17.5. Since the method of factor analysis does not itself lead to the naming of the factors, we shall call Factor I "physical development" and Factor II "scholastic development." Figure 17.5 shows that the physical development factor, a group factor, is present in the three physical measures—with loadings of .85 on height, .87 on weight, and .78 on carpal age. One means of estimating the significance of a factor loading is to square it; e.g., $(.85)^2 = .72$; $(.30)^2 = .09$. Many researchers ignore a loading of less than .50 since its square is only .25. Notice that the loadings of Factor I on the last four tests in Figure 17.5 are small—.21, .30, .27, .25—and have been treated as nonsignificant.

The second group factor, scholastic development, is present in IQ with a loading of .95, language achievement with a loading of .97, reading with .96, and arithmetic with .94. Had only these last four tests been included, we would classify the factor obtained as a general factor present in the four tests. Whether considered in the seven-battery test as a group factor or in a four-battery test as a general factor, our results show clearly that arithmetic, reading, language, and IQ are not specific factors. Also, the two physical measures, weight and carpal age, are not at all present in Factor II; height is present to a very limited extent, with a loading of only .23. This tells us, among other things, that the physical development factor is almost totally independent of the scholastic, and vice versa.

Factor Loadings Resulting from
Analysis of Seven Measures

Variable	Factor I	Factor II
Height	.85	.23
Weight	.87	.00
Carpal Age	.78	.00
IQ	.21	.95
Arithmetic Achievement	.30	.94
Reading Achievement	.27	.96
Language Achievement	.25	.97

FIGURE 17.5.

From this factor-analytic study and others not reported in this chapter, one may safely give no attention to height, weight, and carpal age in attempting to identify gifted, average, and mentally retarded *boys in the elementary grades* when the purpose of identification is to provide differentiated instruction for the three groups in reading, arithmetic, and language.

As suggested earlier, factor analysis is done after correlations are computed, based on measurements of the same individuals. We cannot, therefore, identify general, group, or specific abilities or personality characteristics except as we can secure scores. Further, the researcher draws conclusions based upon the particular tests on which the correlations are based. Caution, a good theoretical framework, and judgment are therefore necessary in attempting to identify and name human abilities and characteristics.

Guilford (1956), for example, described the tests he used, his theoretical framework, and also indicated that his subjects were male Air Force personnel. He subsequently listed many specific intellectual abilities which were identified in these males. One cannot generalize that the same abilities would be found in females of the same age and IQ, or in the total male population of this age, or in younger people of school age. Therefore, the samples on which the measures are taken as well as the specific measures secured are of utmost importance in attempting to generalize about human abilities or other characteristics by use of factor analysis techniques.

SUMMARY

Experimentation, evaluation, and the use of published and other tests are increasing in school situations. Educational workers and psychologists in large numbers are participating in the collection and interpretation of information. Evaluating the outcomes of research requires knowledge of some statistical and research terminology, including measures of central tendency, partition values, measures of variability or dispersion, standard scores, measures of relationship, sampling procedures, significance of differences, and factor analysis.

QUESTIONS AND ACTIVITIES

1. (a) Using Raw-Score Formula 1a, compute the mean for any three variables in Table 17.1.
   (b) Using Raw-Score Formula 6b and the related discussion of standard deviation, compute the variance and standard deviation for the ratings of integration of self concept and behavior pattern.
   (c) For the same two variables, change the raw scores to standard scores, using Formula 7.
   (d) For the same two variables, compute the Pearson product-moment correlation, using Formula 8a.
   (e) For what purposes might a teacher perform such computations as above?
2. (a) Arrange the same two sets of scores as in (1b)—integration of self concept and behavior pattern—into frequency tables, using twelve class intervals.
   (b) Construct a scattergram to show the relationship between the two sets of scores.
   (c) For the same variables, using Formula 3 compute the median; Q_1, Q_2 and Q_3; D_1, D_5, and D_9; P_{10}, P_{25}, P_{50}, P_{75}, and P_{90}.
   (d) What is the relationship among the values obtained for the median, Q_2, D_5, and P_{50}? When would a standard score of .00 be the same as D_5? Using the standard score nearest .00 obtained in (1c), secure the raw score for it to see how closely it corresponds to D_5.
   (e) Examine Table 17.6 and the related discussion carefully. Why is it helpful to school people for publishers of standardized tests to include conversion tables in the test manual whereby raw scores can be changed to percentile scores?
3. (a) Using Formula 5, change the raw scores in *ungrouped form* for the two variables in (1b)—integration of self concept and behavior patterns—to *deviation scores*. Arrange the scores first in rank order from highest to lowest.

(b) Compute the variance and standard deviation, using Formula 6a and the related information about standard deviation.

(c) Compute the Pearson product–moment of correlation, using Formula 8b. Note that the two deviation scores must now be arranged to correspond to each individual's raw scores. Compare the result with that obtained in 1(d).

4. (a) Change the raw scores ot ranks for the same two variables and compute Rho, using Formula 9.

   (b) Compare Rho with *r*, obtained in 3c.

5. Discuss the meaning and use of:
   (a) Partial coefficient of correlation;
   (b) Multiple coefficient of correlation;
   (c) Regression equation.

6. (a) Why is sampling used?

   (b) What is the difference between simple random sampling and stratified random sampling?

   (c) Give the characteristics of the normal distribution curve.

7. Discuss the meaning and possible use of the following:
   (a) Chi-square test;
   (b) Critical ratio;
   (c) T-test;
   (d) F-test with analysis of variance;
   (e) F-test with analysis of covariance.

8. (a) Discuss the meaning and use of factor analysis.

   (b) Discuss the meaning of a general, a group, and a specific factor. Give an example of each.

   (c) What are some limitations of factor analysis?

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